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INNOVATION & TECH

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LEFT TO RIGHT: MILO TARGETT; OLAF BLECKER; CHRISTOPHER ANDERSON

THE MAIL

THE U.K.'S PLIGHT

Sam Knight's article about Conservative rule in the United Kingdom provided a focussed appraisal of the Party's uneven performance ("Time's Up," April 1st). But Knight overlooked one force that has shaped the country's trajectory: the extent to which its government has, since the seventies, transformed from a representative democracy, in which major decisions were made solely by elected officials with support from the civil service, to a popular democracy, in which some of the biggest questions are decided by popular vote rather than by Parliament.

This transformation has created a truly irrational system, which takes important questions influenced by many complicated variables and boils them down to simple binary decisions to be made by people who may not be thoroughly informed. Democracy should remain an ultimate value in the U.K., but, if it is to persist, it must produce positive results for its citizens—something the Brexit referendum clearly has not done. Alas, the supporters of referendums lose track of the ultimate justification for a democracy—namely, that our elected representatives know that we, the voters, can throw them out if we think they are managing the country badly. It is simply wrong to equate this truth with an unproven assumption that voters also have the collective wisdom to regularly make wiser choices about complex issues than our representatives do.

Donald I. Baker
Washington, D.C.

FUTURE ARCHITECTURE

As the executive editor of the *Architect's Newspaper* and *AN Interior*, I enjoyed Kyle Chayka's profile of Koen Olthuis, the principal of Waterstudio ("Water World," April 1st). But the piece also reminded me that *The New Yorker* has not employed an architecture critic since the departure of Paul Goldberger, more than a decade ago. This vacancy seems to have limited the magazine's coverage of the field.

Like the creations of Pavels Hedström, a Swedish designer whom Sam Knight profiled last year, Olthuis's floating buildings combine art and engineering. The singular works of these figures are a far cry from the typical output of most contemporary architects. Today, architecture's major concerns are the environmental impact of materials, the relationship between projects and their communities, and economic and regulatory constraints. As a result, architects responding to the problems of our time often do so in ways that are invisibly bound up with public policy and service (such as mentoring initiatives), and which are hidden beneath the façades of buildings that might look workaday. We will need floating buildings as sea levels rise, but I wish that *The New Yorker* would more diligently address all the other ways in which architects are working to boost our cities' resilience.

Jack Murphy
New York City

As Chayka notes, putting housing on water is not new. In my native country, Iraq, people who live on marshes in the south have built floating-reed dwellings for thousands of years. It strikes me as ironic that, because of human-induced phenomena—rising sea levels in one case, and changes to river flows in the other—places such as Holland are now facing an abundance of water, driving a need for floating homes, whereas places that have long hosted them, such as the Iraqi marshes, are drying up.

Ghassan N. Rassam
Falls Church, Va.

•

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GOINGS ON

APRIL 17 – 30, 2024

What we're watching, listening to, and doing this week.

The **Martha Graham Dance Company** won't officially turn a hundred until 2026, but it's starting the party early with multiple centennial seasons. The theme of the first, at City Center, is "American Legacies." The program includes two classics of nineteen-forties Americana: "Appalachian Spring," Graham's modernist masterpiece with its sound-of-America Aaron Copland score, and a revival of "Rodeo," Agnes de Mille's more conventional Western-themed breakthrough, with its Copland score rearranged for a bluegrass band. These are answered with a première by Jamar Roberts, formerly with Alvin Ailey American Dance Theatre and now freelance. His "We the People" is a protest dance, alternating between struggles in silence and frontal assaults, with fists raised, propelled by the banjo and fiddle music of Rhiannon Giddens, who is known for reclaiming the legacy of Black string bands. It includes much of the America that the other works left out.—*Brian Seibert (New York City Center; April 17–20.)*

MELISSA SHERWOOD

ABOUT TOWN

ART | Take it from a critic who never liked **Christopher Wool** and maybe still doesn't: "See Stop Run," the artist's largest exhibition in ten years, should be visited by everybody with an appetite for aesthetic adventure and without a fear of heights or barbed wire. Situated on the previously abandoned nineteenth floor of a downtown high-rise, it is the opposite of Wool's last big show, at the Guggenheim—there are zero word paintings but plentiful photographs of infrastructure, a mosaic of pink and black scribbles, and wire sculptures that look like scribbles made 3-D. By far the most striking thing is the nineteenth floor itself in all its uncarpeted, crumbly-walled, filthy-ceilinged majesty. You don't feast your eyes on Wool's recent work; you sharpen them and see the decayed afresh.—*Jackson Arn (101 Greenwich St., entrance on Rector St.; through July 31.)*

HIP-HOP | The tri-state rappers **Method Man & Redman** have a working relationship that dates back thirty years, building a buddy-cop dynamic that produced two collaborative albums, a stoner comedy, and even a short-lived sitcom. As performers, they operate on different ends of the lyrical spectrum, finding a balance between control and chaos. Meth, the Wu-Tang Clan's longtime anchor, has always been as rock solid as they come; his casual flows and chest-puffing demeanor suggest an unshakable composure. Red, a former member of the Hit Squad collective, tends to lean more toward eccentricity, with volatile exhibitions marked by cartoonish turns. Individually, they've amassed catalogues of classic material showing off their respective quirks. In tandem, they play to each others' tendencies a bit more. But really they find the most common ground in their shared belief that rap technicality can be its own hotboxed joy ride.—*Sheldon Pearce (Terminal 5; April 19.)*

OPERA | Nadia Boulanger is arguably the twentieth century's most influential pedagogue, having taught such composers as Aaron Copland, Philip Glass, and Quincy Jones, but her sole opera, **"La Ville Morte,"** written with the pianist and teacher Raoul Pugno, was never performed in her lifetime. France's entry into the First World War, in 1914, derailed the première, and the full score was lost. With a soft-spoken yet unsettling sensuality akin to Debussy's "Pelléas et Mélisande," the opera takes place at an archeological dig in the ancient city of Mycenae, where a young woman is the victim of others' unseemly desires and fascinations. **Catapult Opera,** in its own act of excavation, puts on the work's American première in a reconstruction of the orchestration overseen by Boulanger's student David Conte.—*Oussama Zahr (N.Y.U. Skirball; April 19–21.)*

MOVIES | **"The People's Joker,"** directed by and starring Vera Drew, is a sharp-edged parody of Batman's superheroic universe, and of comedy itself, incarnated by the Caped Crusader's sardonic nemesis. The exuberantly D.I.Y. movie, set in a dystopian future, is steeped in Bat-lore, but Drew builds a personal story on the basis of fantasy: a small-town childhood, the anguish of gender dysphoria, the move to Gotham City, the struggle to become a comedian, and the discovery of artistic success—in the persona of Joker the Harlequin—by way of her trans identity. Drew brings this wild but intimate vision to life by way of outrageous antics, lacerating dialogue, and a blend of live action with phantasmagorically janky effects and animation. She opens new dimensions in superhero cinema and in the art of uninhibited (and unauthorized) adaptation.—*Richard Brody (In theatrical release.)*

BALLET | **New York City Ballet's** spring season, part of its expansive seventy-fifth-anniversary celebrations, starts with an all-Balanchine program, a chance to catch the playful and seldom-performed "Bourrée Fantasque," set to the music of Chabrier, from 1949. The immensely satisfying "Dances at a Gathering" (1969), an emotionally redolent Jerome Robbins work set to Chopin piano pieces, receives six performances. In the final week, Balanchine's magical evening-length précis of Shakespeare, "A Midsummer Night's Dream" (1962), fills the stage with magical beings, amorous fools, and fireflies. More recent works include Christopher Wheeldon's moody pas de deux to Max Richter and Clyde Otis, "This Bitter Earth" (2012), and William Forsythe's sharp, stylish "Herman Schmerman (Pas de Deux)" (1993). And on May 2, the company unveils two brand-new ballets, one by Justin Peck—the creator, most recently, of the dancical "Illinoise"—and the other by the immensely versatile choreographer Amy Hall Garner.—*Marina Harss (David H. Koch Theatre; April 23-June 2.)*

TABLES FOR TWO

Corima
3 Allen St.

Before opening Corima, in a moody, rustic space on the bottom edge of the Lower East Side, the chef Fidel Caballero cooked at some of the city's most enjoyably weird and cerebral restaurants, including a residency at Rhodora and a tenure at (R.I.P., sigh) Contra, the thimble-size, Michelin-starred downtown tasting-menu restaurant. Caballero grew up between El Paso, Texas, and Ciudad Juárez, just over the border. He builds his menu on a foundation of northern Mexican ingredients—green chilis, flour tortillas, plenty of cheese—but pulls in various other elements: a bit of France, a bit of China, a whole heck of a lot of Japan. Even the tortillas get a cheffy spin. They are made with butter and a bit of sourdough starter, for flavor, and are cooked over the back of an inverted wok.

This attention-grabbing tortilla is a great specimen, chewy and dimensional. But it was Caballero's jewel-like seasonal sashimi platter that brought me in the door: a gleaming assortment of fish in shades of pink and white. During a recent meal at the bar, though, I learned that it had just recently been eighty-sixed; the bartender instead recommended the hiramasa crudo, which comes dressed in about a zillion things, including a fragrant sesame and chicharrón dust that's something like a Mexican furikake. It was a far cry from the sashimi platter's aesthetic austerity, but the dish was marvellous on its own considerably more maximalist terms.

Corima's menu is laced with uncommon Mexican ingredients such as *chintixtle*, a Oaxacan paste made from dried chilis and shrimp, and *chicatanas*, crisp flying ants that taste like salt and smoke. A bowl of ayacote beans, firm-fleshed with satiny insides, has a whey-and-chile broth whose salt and heat are diffused like sunlight on a cloudy day, with a sliver of headcheese floating on top. A zingy shrimp aguachile is neon-magenta with rhubarb and hibiscus, with sultry notes of shiso and Japanese cherry blossoms. The clever cocktail list includes a now infamous Uni Gin Sour, which is the rare stunt cocktail that actually delivers.

The back half of the dining room is devoted to a tasting menu, priced approachably at ninety-eight dollars. Alas, I found it disappointing, with too many dull moments and little coherence from dish to dish. Even Caballero's miraculous tortillas suffered in the more formal format: mine arrived alongside a nice little piece of Spanish mackerel doused in sweet, thick *amarillito*, but the tortilla itself was already cold in the middle and stiffening at the edges. Corima is likely experiencing the growing pains of a young restaurant trying to master two forms of choreography at once. Luckily, some of the tasting menu's best dishes—including a bite-size course of shaved raw beef over edamame guacamole—were also available à la carte up front. For now, stick to that half of the room. *(Dishes $19–$68.)*

—Helen Rosner

PICK THREE

The staff writer Doreen St. Félix shares current obsessions.

1. It is April in New York City, and it is still cold. I am mad about it. To ward off my upset, I've been listening to "Take One," an album of subversive rock from the Zimbabwean group **Hallelujah Chicken Run Band,** on my daily walks. Formed in the early nineteen-seventies, the band contributed to a sound that would come to be known as *chimurenga*. The music is the result of cross-culture dialogue: traditional Shona melodies, backgrounded by then contemporary rock grooves. A favorite song on the album, recorded in the seventies, is the buoyant "Mudzimu Ndiringe."

2. I finally got a chance to watch **"They Cloned Tyrone,"** last year's début feature from Juel Taylor, and I think it's excellent. It is a kaleidoscope of a movie; a spiral of references ranging from seventies blaxploitation film to contemporary mystery-box sci-fi. A motley crew of characters, including a drug dealer, a pimp, and a "ho"—roles meant to subvert stereotypes—find themselves at the center of a government conspiracy. Jamie Foxx as the slick-talking paranoiac pimp is brilliant. Why didn't this movie blow up?

3. The novelist and critic Maryse Condé died recently, at the age of ninety. Condé, who was born in Guadeloupe, said that the French language "was forged for me alone." That dazzling self-possession is an aspect of her œuvre, which includes plays, essays, memoir, and fiction. Condé was one of our most honest chroniclers of the post-colonial psyche. I recommend starting with her last novel, from 2021, **"The Gospel According to the New World,"** a thrilling rewrite of the New Testament set in Martinique.

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THE NEW YORKER

THE TALK OF THE TOWN

COMMENT
SO MANY TRIALS

The mass of motions, hearings, arguments, and gag orders related to the four criminal cases against Donald Trump can feel like a pile of jigsaw-puzzle pieces. They all fit together somehow, but the arrangement is unclear. In Florida, in the case involving Trump's alleged hoarding of classified documents, Judge Aileen Cannon and Jack Smith, the special counsel, have been engaged in a bitter fight over jury instructions—even though there is as yet no jury, let alone a trial date. Meanwhile, the selection of actual jurors in the case related to a hush-money payment to the adult-film actress Stormy Daniels is due to begin on Monday in Manhattan. Once sworn in, that jury—the first to be impanelled in a criminal trial of a former President—might at last give some fixed form to the jumbled legal picture. Trump, as the defendant, must be present in court. After all the legal posturing, the action will finally get real.

That's the theory, anyway. But the focus will not only be on New York. In a ten-day period beginning on Tuesday, the second day of jury selection, the Supreme Court will hear oral arguments in two cases—Fischer v. United States and Trump v. United States—that could each undermine another indictment that Smith brought in Washington, D.C., involving Trump's actions in the lead-up to the assault on the Capitol on January 6, 2021. The Fischer case will be heard first, on April 16th. It is a challenge to the Department of Justice's use of the Sarbanes-Oxley Act in hundreds of January 6th cases. That statute, which originally targeted corporate fraudsters who obstructed official proceedings by destroying records or other evidence, is the basis of two of the four charges against Trump in D.C.

Then, on April 25th, the Court will consider Trump's outrageous assertion that, as a former President who was never convicted in a Senate impeachment trial, he is immune to criminal charges arising from acts within the "outer perimeter" of his official duties—a line that he believes encompasses his role in the events of January 6th. As an example of how confoundingly intertwined the cases are, a brief that Smith filed last week in the April 25th immunity case includes a footnote contending that, even if the Justices decide in the April 16th Fischer case that Sarbanes-Oxley can't be used against *most* January 6th defendants, he should still be able to use it against Trump. (Smith's argument is that Trump's alleged solicitation of fake electoral certificates in seven states counts as classic meddling with evidence under Sarbanes-Oxley.)

And so, at the same time that Judge Juan Merchan, who is presiding over the New York trial, will be going through a list of forty-two questions with prospective jurors (What podcasts do they listen to? Have they ever been to a rally for Trump? How about to one for an "anti-Trump group"?), the Justices will be asking whether the D.C. trial should be gutted, or should even take place at all. One jury forward, two oral arguments back. It's hard to know which way to look.

There is not so much a split screen as a tessellating one. Before the month is out, there will doubtless be more developments in Florida, too, and in the fourth criminal case against Trump, in Georgia, in which he is charged with conspiring to overturn the election results in that state. And there are the various ongoing civil proceedings, in which Trump is appealing orders that he pay more than half a billion dollars in damages and interest to New York and to the writer E. Jean Carroll.

Still, despite an almost constant frenzy of legal action, it can seem as though very little has actually happened. The New York trial is first because the other criminal cases are moving so slowly. Trump, who denies all wrongdoing, has, unsurprisingly, made use of whatever delaying tactics he can. (The *Times* recently calculated that he has already racked up more than a hundred million dollars in legal fees, which have largely been covered by donors and PACs.)

But there are additional reasons for

ILLUSTRATIONS BY JOÃO FAZENDA

the drawn-out pace. Judge Cannon, a Trump appointee who is new to the bench, has not been quick to rule on motions, and has issued orders that are confusing or have alarmed prosecutors because they suggest that she might be ready to accept some of Trump's more farcical legal arguments. And although a number of the Florida charges, involving obstruction and making false statements, seem clear-cut, thirty-two counts rely on the Espionage Act, a statute with gray areas that have never been fully adjudicated by the Supreme Court, even without a former President as the defendant. Cannon was not entirely wrong when she referred, in a ruling last week, to the "still-developing and somewhat muddled questions raised in this criminal case."

In the meantime, the Georgia prosecution has not quite emerged from the mess surrounding an attempt by Trump and some of his co-defendants to disqualify Fani Willis, the Fulton County district attorney. That effort stemmed from Willis's romantic relationship with Nathan Wade, an outside lawyer whom she hired to work on the case. The judge found that he had no basis to remove her, but was so sharply critical of her choices, including her rhetoric, as to all but invite an appeal. That process is now under way. Given, though, that Willis brought the case with a sprawling RICO indictment against Trump and eighteen others (four have since pleaded guilty), it was never going to move quickly.

It is the New York case, then, that will first force the question of what exactly it means for Trump to be brought to justice. That concept can be writ small or large. There is a kind of justice in Trump's being told to sit still and behave (and being sanctioned if he doesn't), but comeuppance can't be the main point. A case about hush money can't really offer accountability for an attempted coup; nor can it fully address the understandable, widespread frustration that Trump has secured the Republican nomination despite the weight of the pending cases against him. And, while the New York charges carry the possibility of prison time, a conviction would not legally bar him from the Presidency. At this point, only the election in November can do that.

Trump's worst characteristic may be his disdain for the rule of law; one of the best things a trial can do is to demonstrate the law at its fairest. The jury will have to weigh issues such as the credibility of a key witness, Michael Cohen, Trump's former lawyer. One of the hardest questions that Merchan will ask prospective jurors is whether they can put aside everything else and decide the case based solely on what they see and hear in the courtroom. There's a lot of noise outside.

—Amy Davidson Sorkin

LONDON POSTCARD

FORENSIC FURY

Hanan Wahabi, who is forty-six and works as a special-ed coördinator, was born in St. Mary's Hospital in West London and grew up less than two miles away, on Portobello Road, in the Royal Borough of Kensington and Chelsea. She attended local schools, married at twenty-one, and became a mother at twenty-two. The next year, she was delighted to secure an apartment on the ninth floor of a nearby public-housing tower block; her brother Abdulaziz lived with his wife and three children on the twenty-first floor. On June 14, 2017, a fire broke out on the fourth floor shortly before 1 A.M. Residents were advised to stay in place, but Hanan's sixteen-year-old son insisted on taking his eight-year-old sister downstairs and urged his parents to escape. They watched in horror from the street as the fire engulfed the building. The advice to stay put changed shortly before 3 A.M., by which time it was too late for Abdulaziz and his family. They were among the seventy-two residents of Grenfell Tower who died as a result of the fire.

One recent afternoon, Wahabi took a walk in the neighborhood with Gillian Slovo, a novelist and playwright whose verbatim drama "Grenfell: in the words of survivors," which premièred at the National Theatre in London last year, comes this month to St. Ann's Warehouse. Wahabi is one of nine former residents of the tower whose words—which are drawn from interviews with Slovo and from the official inquiry into the disaster—have been woven together in what the *Guardian* called "a masterpiece of forensic fury." Also included are damning testimonials given at the inquiry by employees of Arconic, Celotex, and Kingspan, the companies that manufactured the highly flammable cladding and insulation that the inquiry has said allowed the fire to spread so rapidly, and footage of the former Prime Minister David Cameron announcing a reduction in red tape around building regulations. The second part of the inquiry's report will be published this summer; so far, no one has faced criminal charges. "People should be jailed for what they did, and what they didn't do," Slovo said.

The neighborhood was a lovely place to grow up, Wahabi remarked, as she made her way through a sliver of parkland that lay in the shadow of the Westway, a six-lane highway thundering overhead. "There was a community, and it was safe," she said. After the fire, Wahabi and her family were housed in a single hotel room. The strain took a toll on her marriage; she and her husband, Salah, separated, and his health declined. Salah died from complications of diabetes last year. "We were together for twenty years, until Grenfell broke us," she said. On a bank in the park, a sapling was almost in

Gillian Slovo and Hanan Wahabi

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bloom. Beneath it was a plaque in English and Arabic memorializing three of the locals who died in the tower, including Wahabi's sister-in-law Faouzia. It read "From God we come and unto him we return."

The borough of Kensington and Chelsea is home to some of the wealthiest people in Britain; a block from Grenfell is Clarendon Road, where houses sell for more than ten million pounds. David Cameron owns a house nearby. "I'm not saying I live next door to David Beckham, but I live five minutes away from him," Natasha Elcock, who lived on the eleventh floor of Grenfell, is quoted as saying in the play. "I never saw it as a deprived area . . . it's only since June 14 you start to think, my god, we were categorized as poor." When residents made 999 calls to the fire department, some were met with condescension: Abdulaziz was told to calm down by an operator, who then guided another resident of his floor to safety. "My brother had an accent, the other man didn't," Wahabi's stand-in, the actress Mona Goodwin, says in the play.

Thirty-five languages were spoken in Grenfell Tower, a fact memorialized on mosaic tiles embedded in sidewalks marking the route of a silent walk that is taken by some survivors on the fourteenth of every month. Wahabi is not among the regular walkers: she avoids the tower, now a charred hulk wrapped in white plastic sheeting. But she does sometimes pass by the nearby primary school, which her daughter, Sara, attended. It is now home to the El-Wahabi Orchard, memorializing her family.

After eighteen months in the hotel room, Wahabi moved to a flat near her old neighborhood. "I was very specific that I didn't want to see the tower," she explained. "It was spring, so there was lots of greenery. But, when autumn kicked in, I realized I could see the tower. Initially, I thought, Oh, my God, but then—I can see exactly where my brother died. I can see just the top, and I can see the window they all died in." She went on, "Sometimes I will come out of the house, and I will just stand and look. And remember, and reflect, and talk to them."

—Rebecca Mead

DEPT. OF INSPIRATION
HERE TODAY

"I've never been a lie-around-on-the-beach kind of guy," Ian Adelman said recently. As a boy in Maine, he and his father would make drip castles in the sand. "As I got older, and beach trips became more about people lying around—that was not me," he recalled. His sandcastle habit grew. During the pandemic summer of 2020, as he and his family isolated at their beach house, in Water Mill, New York, it turned into a near-daily ritual. He bought masonry trowels and built Frank Gehry-esque towers of slopes and swirls and terraced pathways, documenting the results on Instagram. "I had some pieces that were the size of a couple of adults," he said.

It was late morning, and Adelman was crouched in the sand at the Gansevoort Peninsula, a new man-made beach jutting out from the West Side Highway, across from the Whitney Museum. He'd been at work for more than an hour: cleaning sand of junk (sticks, a hair tie), mixing it with Hudson River water in a bucket, and piling it into a navel-high mound. Now it was time to start cutting away. The overcast sky was good for castle-building—too much sun dries out the sand—but Adelman was trying to be discreet. "I had a little run-in with Parks Enforcement," he said.

Beside him was Adam Moss, his former boss, who features Adelman's sandcastles in his new book, "The Work of Art." After leaving his post as the editor-in-chief of *New York* magazine, in 2019, Moss devoted himself to painting, but his ambition outstripped his ability. "I kind of just wasn't any good," he said. On a trip to Spain, he was in the gift shop of the Guggenheim Bilbao and saw one of Gehry's squiggly sketches for the building. In the galleries, he'd been enraptured by an unfinished portrait by Alice Neel. Frustrated in his own work, he decided to demystify the artistic process by interviewing more than forty artists working in different disciplines, including Stephen Sondheim, Kara Walker, and Sofia Coppola. While writing the book, Moss had lunch with Adelman, who had designed *New York's* digital publications, and found out about Adelman's sandcastle sideline. "I had been talking to all these other artists who were basically making things that would last forever," Moss recalled. "It was the *making* that consumed them, and many were kind of indifferent to the results. So I thought, Well, sandcastles are a pure example, because they disappear."

Adelman studied his mound. Using a trowel, he cut a gem shape into the top. "It's about carving, not so much about building," he said.

"Subtraction! That's a big theme in my book," Moss said. Adelman, who has A.D.D., had told Moss about the state of hyperfocus he achieves while building sandcastles, which chimed with, say, how Michael Cunningham

Ian Adelman and Adam Moss

had described writing "The Hours." Moss asked Adelman, "When did you decide—or are you deciding right now—what you want this to be?"

"Well," Adelman replied, "last night, as I was going to sleep, I was, like, I'm going to think about what I want to make tomorrow, and then either I'll come up with an idea or I'll fall asleep. I fell asleep."

"At this moment, it's looking like the 'Close Encounters' mound," Moss observed.

Adelman smoothed the side of the tower with his palm, then cut out a winding crevasse, blowing away excess

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grains with a metal straw. The best sand he's worked with, he said, was in Tulum. Coney Island has good sand, but lots of debris. At Gansevoort, a passerby once offered to help him build. Rain or tides or peeing dogs tend to destroy his creations within a day, but he finds the impermanence freeing. "If this were stone, I would be so paralyzed," he said.

Suddenly, he slashed a triangle through the base of the tower, letting a clump of sand fall. "Wow, that radical act that you just did!" Moss marvelled. "Is that something you did impulsively?"

"I had not thought about it," Adelman said. A fluffy white dog trotted by. "Here's the enemy," he said warily, before its owner nudged it past. Adelman carved a shell-like pattern into the tower's southern face; it started to look like a miniature cousin to the Whitney.

"It's too bad we can't put shellac on it and make it permanent, and then a thousand years from now it'll be like Stonehenge," Moss said. A toddler ambled by with her mother and yelled, "I want to make one!" Adelman gave her some wet sand, and she started building her own mound nearby.

When Adelman was done, he walked away. "It's a peaceful feeling," he said. As he loaded up his bicycle, two teen-agers came by and started modifying his creation. Adelman looked vexed: "I expected it to last a *little* bit longer than that."

—*Michael Schulman*

THE PICTURES IN THE STACKS

If you go down the escalator in a building on Liberty Street, in the financial district, walk past some pickleball courts and an Alamo Drafthouse movie complex that sells truffle popcorn, and then take a few turns in a maze of basement hallways, you will find yourself in a space that might convince you, with its tall stacks of dusty VHS tapes, that the nineties never ended.

The tapes are part of the collection of Kim's Video, the legendary movie-rental store. From the late nineteen-eighties—long before truffle popcorn or pickleball—to 2009, Kim's offered New York film buffs a catalogue of rare titles. That year, Youngman Kim closed the store's main location, on St. Marks, and more than fifty thousand tapes and DVDs were hastily packed and sent to Sicily, where the mayor of Salemi, a small town with Marfa-esque cultural aspirations, agreed to house them, on Kim's condition that they would be made available to the public. The Salemi Kim's never became fully operational, however, and, after languishing in boxes for a dozen years, the collection made its way back to New York. (The story of how this happened is chronicled in "Kim's Video," a new documentary by David Redmon and Ashley Sabin.) Alamo Drafthouse stored the trove, offering select titles to its customers to borrow for free.

This is when the director and cinematographer Sean Price Williams, who once managed the St. Marks Kim's, got involved. "I would get annoyed thinking about it every night before I went to bed," he said the other day, among the VHS tapes. The Alamo people, he said, "didn't really know what they had in the boxes, and it was just this pop-up thing where they prioritized DVDs. I couldn't have *that* be the thing that represents Kim's Video." He contacted Alamo and volunteered to cull the tapes for free.

Williams, who is forty-six, is tall and broad, with wavy brown hair. He's shot many American indie movies, including the Safdie brothers' "Good Time" and Alex Ross Perry's "Her Smell," and recently directed a feature, the comic picaresque "The Sweet East." But for the past year and a half he's spent most of his Fridays in the Liberty Street basement, where he goes over the Kim's collection with a rotating cast of friends. In the stacks that day were Nick Pinkerton, a long-haired, bespectacled onetime Kim's clerk who wrote the screenplay for "The Sweet East," and Conor Fay, a fresh-faced youngster who served as a P.A. on the movie.

"I worked at the St. Marks Kim's and Nick worked at the Avenue A one and Conor was, I guess, just getting born," Williams said. "I feel like, when I'm here, I'm doing a job no one else can do as well as me." He laughed. "It's the only time I feel like that in my life!"

He picked up a clutch of tapes. "We're prioritizing VHS, and things that have been discontinued or drifted out of consciousness," he said. "So, if it's, like, a cable-access compilation from the nineties that you can't find anywhere else, we keep it." A tape of the avant-garde chanteuse Diamanda Galas was a yes. So were the snuff-compilation tape "Traces of Death" ("So witless and revolting," Pinkerton said approvingly), a movie by the Austrian performance-art provocateur Valie Export, and a nineties Italian procedural about Pasolini's murder. But there were some nixes, too.

"We've made significant progress in T-shirt-cannon technology."

" 'Interview with a Vampire'? Out. 'Saving Private Ryan'? Out." Anime titles were put aside, too. "We know some of this stuff is rare, but none of us give a shit about it," he said. "We hope that someone who cares comes by."

"We just don't know any nerds, unfortunately," Pinkerton said. "Only alphas."

Williams was fired from Kim's in 2005. ("Mr. Kim just said it was for 'ethical reasons.' It was out of nowhere. Very hurtful!") Afterward, to retain his cinephilic mojo, he began compiling a list of his thousand favorite movies, using an Excel chart. The entries have shifted over the years as Williams discovers other films that he likes, and the list has recently become a book, titled "1000 Movies," published by Metrograph Editions. Organized by year, it includes such classics as Hitchcock's "Rear Window" and Godard's "Le Mépris" alongside obscurities like Vincent Gallo's unreleased 2010 drama, "Promises Written in Water," and some seeming larks, like the 1987 erotic romp "Emmanuelle 5."

"I don't believe in guilty pleasures," Williams said. "Like, 'I know it's bad, but I love it.' That's a crummy way to think." He went on. "What if 'Emmanuelle 5' *isn't* bad? If there's enough moments in the movie that really get you, then what else are you looking for?"

He eyed a compilation of Japanese noise music. "When I was seventeen and working in my first video store, the guys who owned it were, like, 'Now that you're dealing with movies all day you're going to stop loving them.' And I just refused to believe that was true," he said. "The more movies I see, the more movies I want to see. I still can't get enough."

—Naomi Fry

DEATH VALLEY POSTCARD
SHORT-TERM LAKE

Manly is an ancient pluvial lake in Death Valley National Park which only sometimes exists. It forms intermittently in Badwater Basin, North America's lowest point, following periods of heavy rain. After August's Hurricane Hilary, the lake was suddenly there. A more recent deluge caused it to swell to six miles long and a foot deep, across America's driest place.

At 4:45 A.M. on a Saturday, Patrick Donnelly loaded six inflatable kayaks into his truck and drove from Shoshone, California, to the park. The moon, a waxing gibbous, shimmered through clouds onto the salt flats. Donnelly is a conservation biologist at the Center for Biological Diversity. His days normally involve composing rants against mineral companies and writing endangered-species petitions for rare flowers and fish. (He has said that "a well written Endangered Species Act petition should bring the reader to tears.") "I'm not much of a boater, and here I am leading an armada," he said. He'd bought the kayaks a week earlier and had been out on the lake three times since. "People should know magic still exists."

Donnelly met a small group of boaters on Manly's shore just before sunrise: Laura Crane, a conservationist from Joshua Tree; her partner, Paul Bessire, who worked at the Natural History Museum of Los Angeles County; and Dex Lim, a geology student from Las Vegas. The group ogled the glassy expanse of water and the snowcapped mountains beyond, and then got to inflating the kayaks, which slowly wheezed to life. "You have to be gentle," Donnelly said. He wore a white cowboy hat, cargo pants, and hiking boots that were stiff with salt and mud. He advised that closed-toe shoes were preferable—the lake's salt-crusted banks could slice up feet. "You absolutely cannot drink," he said, meaning the lake water; Manly is several times saltier than the ocean. "I'm printing T-shirts," he said. "The Lake Manly Yacht Club."

Donnelly, who is forty-one, was raised in the Northeast. When he was nineteen, he worked as a traffic reporter for Cablevision in New York City. In his early twenties, he moved to Moab, and on his first day there he drove to the national park in the morning. "The sun was lighting all those rocks on fire," he said. "I was just, like, 'Oh, I'm on Mars.' I'd never given the desert half a thought." He read Edward Abbey, and became a desert fanatic. These days, Donnelly says he is "a quarter lobbyist, a quarter field biologist, a quarter P.R. flack for bunnies and buckwheats, and a quarter project supervisor." He has lived at the edge of Death Valley for about a decade. He sees himself as one of the area's few chroniclers of climate change and of rare desert phenomena. Last year, he was working in Carson City, Nevada, when what's commonly called a Superbloom (Donnelly: "All blooms are super") of wildflowers, including Fremont's phacelia and pepperweed, appeared back in Shoshone. He commuted eight hundred miles round trip most weekends.

When the kayakers were done pumping, they set out west, toward the Panamint Range. They had the lake nearly to themselves. As they drifted, Donnelly noticed that Lim's kayak seemed to be folding in on itself: a leak. "Dex, did you inflate the bottom of that?" he called out.

"I was wondering if it was starting to get a little squishy on me," Lim said.

Donnelly paddled over with a pump. They floated on. Paddling next to Crane, Donnelly recounted a time, during the heavy winter rain in 2015, when he went boating down the normally low, but then raging, Amargosa River. He got caught in a mesquite tree and capsized. "I went back three months later and found pieces of the boat," he said.

This reminded Crane of a friend of a friend in Twentynine Palms. "He went hiking in the wash and found this really cool rusted machete," she said. He brought it home. He later went on another hike in the wash and found a human skull. He gave it to the police, who connected it to a murder committed with the machete, which was covered in blood, not rust.

The group paddled for a mile. The sun occasionally glimmered through fish-scale clouds, and the air alternated between warm and cold. Salt coated everything—clothes, water bottles, a banana that Bessire had brought as a snack. After a few hours, they paddled back toward shore. People were dragging watercrafts through mud to the lake's edge.

At two-thirty the next morning, Donnelly set out again for Manly alone, to kayak under a full moon—one of his last voyages, because a week and a half later forty-mile-an-hour winds blew the lake two miles north. The water was evaporating, and soon the National Park Service closed Lake Manly to boaters.

—Meg Bernhard

The best-known longevity evangelist may be Peter Attia, a co-author of "Outlive."

DEPT. OF MEDICINE

NO TIME TO DIE

When does the quest for a healthy life become unhealthy?

BY DHRUV KHULLAR

Some of my earliest memories are of summers with my grandparents, in New Delhi. I spent long, scorching months drinking lassi, playing cricket, and helping my grandparents find ripe mangoes at roadside markets. Then I'd return to the U.S., my English rusty from disuse, and go months or years without seeing them. At some point, my India trips started to feel like snapshots of loss. My grandfathers died suddenly, probably of heart attacks. My Biji, my father's mother, fell and broke her hip in her seventies, and she spent her last years moving back and forth between her bed and her couch. My Nani, my mother's mother, developed excruciating arthritis in both knees; in order for her to leave her fifth-floor walkup, my uncle practically had to carry her down the stairs. I have always wondered whether their fading vitality—the way their worlds contracted and their possibilities vanished—was an inevitability of aging or something that could have been averted.

Many of us have come to expect that our bodies and minds will deteriorate in our final years—that we may die feeble, either dependent or alone. Paradoxically, this outcome is a kind of success. For most of history, humans didn't live long enough to confront the ailments of old age. In 1900, a baby born in the U.S. could expect to live just forty-seven years, and one in five died before the age of ten. But twentieth-century victories against infectious diseases—in the form of sanitation, antibiotics, and vaccines—dramatically extended life spans, and today the average newborn lives to around seventy-seven. Lately, though, progress has slowed. In the past six decades, medicine has added about seven years to the average life span—less by saving young lives than by extending old ones, and often in states of ill health. In many cases, we're prolonging the time it takes to die.

A growing number of celebrity doctors, futurists, and so-called biohackers now argue that it doesn't have to be this way. There are, by some estimates, hundreds of specialized "longevity clinics"—including some that charge six-figure annual fees—which claim to offer more of the world's most valuable commodity: years of healthy life. Perhaps the most prominent longevity evangelist is Peter Attia, the author, with Bill Gifford, of the best-selling book "Outlive: The Science and Art of Longevity." Through his telemedicine practice in Austin, Texas, for an undisclosed price, Attia offers health advice, diagnostic tests, exercise protocols, and supplements to a wealthy and exclusive clientele. He also interviews an eclectic mix of scientists, doctors, and entrepreneurs for a popular podcast, "The Drive." Oprah has interviewed him; Hugh Jackman and Gwyneth Paltrow follow his regimens.

Attia graduated from medical school and trained to be a surgeon, but grew disillusioned during residency and dropped out. He became a consultant for McKinsey instead, and then worked for an energy company. Finally, in his mid-thirties, a fixation with his own health brought him back to medicine. As a new father, he learned that he was prediabetic, and he reflected on men in his family who'd died early, of heart disease. In his book, he describes his former physique as "sausage-like"; on a beach one day, his wife told him, "Peter, I think you should work on being a little less not thin." Soon, he was "down the rabbit hole of complete physical optimization."

Attia, now fifty-one, has become convinced that science, technology, and targeted work can solve a uniquely modern problem: the "marginal decade" at the end of our lives, when medicine keeps us alive but our independence and capacities bleed away. It's a scandal, in

ILLUSTRATION BY JUN CEN

his view, that our life span has grown so much more than our *health* span. Many of Attia's prescriptions are obvious: work out, eat healthily, sleep well, nurture relationships. (The Harvard Study of Adult Development has found, in eight decades, that human connections may be the single most critical determinant of long-term happiness and health.) But Attia often extrapolates from scientific data to offer jarringly intense and specific advice. Want to be able to lift a grandchild when you're eighty? Goblet squat fifty-five pounds when you're forty. Hope to lift yourself off the floor unassisted in old age? Try "toe yoga." Attia notes that each decade after thirty we lose a meaningful amount of muscle mass and cardiovascular fitness. If we wish to slow that decline, and to complete a "Centenarian Decathlon" of important late-in-life activities—carry groceries, climb stairs, have sex—we need to become "athletes of life."

The increasing obsession with longevity has inspired a backlash. Many in the life-extension movement are quacks or hacks who peddle pills, potions, and false promises; longevity skeptics tend to see the loss of our capacities as something to accept, not avoid. Ezekiel Emanuel, an oncologist and a health-policy professor at the University of Pennsylvania, derides Attia as an "American immortal" who overcomplicates straightforward advice. "The idea that you're going to get another healthy decade of life just by doing the things he says is hocus-pocus," Emanuel, who served as a special adviser to the Obama Administration, told me. "No one's got that evidence." Half an hour of daily exercise clearly improves and extends lives, but it's hard to prove that Attia's intensive regimens are much more beneficial. By incessantly preparing for the future, the skeptics say, we mistake a long life for a worthwhile one.

On a recent afternoon, I chased my three-year-old daughter around the playground for an hour. When we returned home, she spread a jigsaw puzzle out on the floor and looked up expectantly. I liked the idea of sitting still, but my knees hurt and my back was tense. I had to transfer the puzzle to a grownup table and sit my daughter in a booster seat. She didn't seem to mind, but I remember that day as the first time that my physical limits noticeably constrained what we could do together. Longevity has become a concrete problem, just as it was for my grandparents: I wake up with aches in long-ignored joints and tendons; I calculate, with dismay, the age I'll be when my children graduate from college or start their own families. One day, we're going to die. What should that mean for how we live today?

In 1980, James Fries, a Stanford rheumatologist, predicted in *The New England Journal of Medicine* that better medicines and behaviors would soon enable a "compression of morbidity," which would delay disease and debility until the very end of our lives. In the late nineties, Fries supported his hypothesis by publishing a decades-long study. University of Pennsylvania graduates who, in their forties, exercised more, weighed less, and didn't smoke much were half as likely as others to suffer a significant disability in their seventies; they seemed to postpone the onset of disability by more than five years. But the alumni of an élite college may not have been representative. Fries died of end-stage dementia in 2021, at the age of eighty-three, and his broader prediction never seemed to come true. If anything, longer lives now appear to include *more* difficult years. The "compression of morbidity may be as illusory as immortality," two demographers, Eileen Crimmins and Hiram Beltrán-Sánchez, wrote in 2010. According to the World Health Organization, the average American can expect just one healthy birthday after the age of sixty-five. (Health spans are greater in countries such as Switzerland, Japan, Panama, Turkey, and Sri Lanka.)

Earlier this year, I flew to Austin to hear Attia's thoughts about how to change that. When my Uber pulled into his driveway, he was finishing his morning workout, so an assistant led me inside, where I spent a few moments looking at Formula 1 paraphernalia. Floor-to-ceiling windows overlooked lush hills, and a herd of life-size elk and deer models stood in the sun. I would soon learn that they served as targets for archery practice.

Attia has a shaved head, a sharp nose, and a stubbled chin, which make him look like a mix of Stanley Tucci and Jeff Bezos. When he appeared, he was wearing a fitted T-shirt that emphasized his biceps. He led me to his kitchen, where he offered me coffee and mixed a brightly colored concoction for himself. "I always try to get some protein in the morning," he said. He eats as many as six sticks of venison jerky a day.

When I asked Attia about the longevity movement, he bristled. The term "just smells of snake oil," he said. "Most of what I see out there is what I think of as sci-fi longevity. *We're going to live to be two hundred, and death is going to become irrelevant*." He handed me my coffee. "The way I talk about it is in a very low-tech way." Attia has said that he wouldn't want to live forever, even if he could, and he seems wary of a stereotype of longevity doctors. At parties, he sometimes pretends he's a race-car driver or a shepherd. "I thought I was going to get skewered for writing 'Outlive,'" he told me. "I thought doctors were going to say, 'This guy is a grifter. He doesn't know what he's talking about.'" Some do say that—but others have become his followers.

Like a consultant, Attia often explains himself using frameworks. In the time of Hippocrates, he said, there was Medicine 1.0, a pre-modern system of diagnosis and treatment based on observation, anecdote, and guesswork. In the twentieth century, Medicine 2.0 deployed the randomized controlled trial to produce scientific marvels such as dialysis, organ transplants, and antiviral drugs. But Attia also sees Medicine 2.0, arguably the type of medicine that I practice, as passive. It often acts after the onset of damage—debilitating arthritis, a broken hip—instead of aggressively and proactively warding off illness and injury. Attia preaches Medicine 3.0.

We sat down at a sort of command center in his home office. On a large monitor, Attia pulled up a patient's "longevity risk assessment"—his team's calculation of threats to life and limb, ranked by relative importance both now and in the future. Although Attia describes his approach as low-tech, his patients receive dozens of tests, some of them outside the medical mainstream: full-body MRIs, body-fat-composition scans, DNA analyses. He often screens for Alzheimer's risk, something that

many doctors advise against, in part because patients can't do much about a distressing result. (While filming an episode of the longevity docuseries "Limitless," Chris Hemsworth, the host, learned from Attia that he has a gene associated with a roughly eight-hundred-per-cent increase in Alzheimer's risk; afterward, Hemsworth took time off from acting.)

The assessment on Attia's monitor was for a middle-aged patient who had been given a diagnosis of attention-deficit disorder, and had also undergone several surgeries. Running down the left side of a chart was a list of conditions, starting with the ones that posed the greatest risk: emotional-health problems and physical injury. The right side showed percentages—the guesstimated chance that each condition would become an issue in the future. Cancer and neurodegenerative disease were small risks now, but they ballooned into dominant hazards later in life. "It's more art than science," Attia told me. "There's no A.I. that's ever going to be able to spit out these numbers. It requires clinical judgment."

The patient's results seemed to trouble Attia. "They're on a path to have a very physically debilitated last decade of life," he said. (His practice omitted the names of patients and asked me to change their pronouns, to protect their privacy.) Attia's staff focussed on three near-term suggestions: see a recommended therapist, work with a recommended exercise team, get a colonoscopy. They may have been powerful in their simplicity, but they were standard enough that I wondered whether all that testing was really necessary.

Many more patients will soon receive a version of Attia's advice. Not long ago, he débuted a program called Early, a kind of MasterClass on longevity which costs twenty-five hundred dollars to access online. In a series of slick videos, Attia—in the hybrid persona of doctor, teacher, and coach—sits in a leather chair and talks about anticipating and averting diseases. Soft music plays; one video cuts to Attia's muscles tensing as he aims a manual crossbow and strikes a faraway target. "Hope is not a strategy," he says later, looking into the camera. "The marginal decade is the most important decade."

When I asked Attia what he sees as a threat to his own longevity, he spoke of a lifelong battle to keep his emotions in check. He previously described himself as a workaholic with anger-management issues. During a business trip in 2017, he received a call from his wife, who was in a state of terror: their month-old son had stopped breathing and turned blue, and didn't have a pulse. She'd started CPR on his tiny body. By the time first responders arrived, he'd regained a heartbeat and his skin was transitioning to pink.

"Okay, call me when you get to the hospital, so I can talk to the doctors in the ICU," Attia remembers telling her, in his book. Then he went to dinner. Ten days passed before he flew home.

"I don't try to forgive myself for it," Attia told me recently. "There was a really, really broken person who did those things." He paused, as though replaying the episode in his mind. "Don't ever forget that that bastard is out there. . . . And make sure you work really hard to keep him at bay."

The quest for physical optimization can easily become a substitute for deeper fulfillment. A decade ago, Attia exercised twenty-eight hours a week and observed a strict ketogenic diet. His "biomarkers were out of this world," he has said, but he refused cookies that his children baked for him and pasta during trips to Italy. "I was doing *everything* to live longer, despite being completely miserable emotionally," he writes in "Outlive." In a recent interview with the *Times*, Attia said that, before attending an event at his son's kindergarten, he thought for a moment of the downsides: it would eat into his time for squats and deadlifts. "That's costing me a little in terms of fitness," he said. "But that's the trade-off I wanted to make."

Attia wouldn't tell me how many patients he sees, or how much they pay; there has been speculation that his services cost around a hundred and fifty thousand dollars a year. One of his clients, Carl Barney, is the eighty-two-year-old founder of a nonprofit inspired by Ayn Rand. He told me that, during the past three years, Attia has encouraged him to diversify his exercise routines and sleep more. At Attia's urging, he now scoops collagen protein powder into his morning tea, drinks bone broth before dinner, and tries to consume another hundred-plus grams of protein during the day. I asked him whether Attia's advice was worth the high price. "I have wealth, so, for me, it's a bargain," he said.

Attia let me join a video call in which five telegenic members of his team discussed new patients. A primary-care doctor told the group about a patient who managed career stress by engaging in extreme sports. "If they can't do those things, a lot of their coping mechanisms will crumble," she said. But it is difficult to quantify the risk that an injury might incapacitate someone. "We have questions like 'Do you wear a seat belt?'" the doctor said. "We don't have questions like 'Do you cliff-jump into the ocean?'"

The patient's tests had identified hearing and vision issues; a full-body MRI showed ambiguous cysts in an internal organ. Genetic screenings suggested early-dementia risks, and the patient had recently asked the team, "Should I just quit my job right now and focus on living my life?" But a neurologist observed that the patient's relatives had developed dementia only later in life. "This is probably going to be the most hopeful piece of news we give them," Attia said. "We can say, clearly, no. . . . We have a lot of runway."

I was envious that the doctors could pay so much attention to one patient. Attia had time to ask how well this person flossed—something I don't ask my wife, let alone the patients I see in fifteen-minute increments. But the primary-care doctor made me ponder whether there was such a thing as too much attention. The patient struggled with anxiety, she said, and seemed to be looking for validation of their fitness routine. "Instead, we show them all these medical problems," she joked. "And then we're, like, 'Why are they so anxious?'"

A few years ago, Attia started an intense fasting regimen. Some lab studies have suggested that fasting may reduce inflammation and clear the body of precancerous cells, but there is no

agreed-upon "dose" for healthy fasting; Attia decided that for about two weeks each quarter he would drink only water. After losing fifteen pounds of muscle, however, he abandoned the practice. "He has always been extreme," Steven Levitt, the University of Chicago economist and co-author of "Freakonomics," who is a patient and a friend of Attia's, told me. "Peter has been wrong a lot, but he changes his view when he runs into evidence that contradicts his theory." Levitt trusts and admires Attia, but acknowledged that Attia's fans in the longevity movement could go too far. "Followers often become more extreme than the leaders," he told me.

Attia takes rapamycin, a drug that affects the immune system and is normally used by organ-transplant patients; the drug, which occasionally gives him mouth sores, has seemed to lengthen the lives of laboratory animals. Animal experiments are unreliable indicators of how drugs work in humans, and rapamycin is not endorsed by the Food and Drug Administration or medical societies for prolonging life. "This isn't like a vitamin," Eric Topol, a cardiologist and the director of the Scripps Research Translational Institute, told me. "It's a serious drug that can potentially lower your body's ability to fight off infections." When I asked Attia why he has promoted the drug in his book and on his podcast, he said, "There's a big difference between saying everyone should take rapamycin and saying, 'I take rapamycin.'" He also cited a study suggesting that rapamycin bolstered immunity in elderly people.

It's clear that Attia *has* prompted people to take the drug. Topol said that some of his patients had read "Outlive" and then asked him for prescriptions. "People see him as the expert, so they are going to try something if he says he's doing it," he told me. "His followers aren't going to be able to detect which recommendations are firmly grounded in evidence." Meanwhile, training dozens of hours a week might take more time than it will ever tack on; good health could even drag out some terminal illnesses. "Peter's theory of Medicine 3.0 is that you get this long life where you're healthy, and then you fall off a cliff," Topol said. "It would be great if it were true. There isn't any evidence for it."

"How much longer before your divorce goes through?"

• •

Emanuel, the University of Pennsylvania professor, has said that he wants to live to seventy-five. (He is sixty-six.) "Living a long time is not an end in itself," he told me over Zoom. "If it becomes the focus of your life . . . that is one of the worst mistakes you can make." It's not that we *shouldn't* exercise or eat well—but "everyone goes through a decline," Emanuel said. "Spending your life worried about all these tiny things is a waste of time."

During our video call, Emanuel walked to his bookshelf, pulled out a copy of "Outlive," and read a line from the epilogue: "It was only after much reflection on this whole experience that I really began to understand how emotional health relates to longevity." He slapped his palm against his forehead in a mock epiphany. "Oh, really? Longevity doesn't matter if your life sucks? . . . I mean, come on. It's ridiculous."

Leon Kass, who served as the chair of the President's Council on Bioethics under George W. Bush, has written that losing our capacities might be a kind of prerequisite to accepting our mortality: maybe the slowing of body and mind is what makes death tolerable. He quotes Michel de Montaigne, the sixteenth-century essayist. "Inasmuch as I no longer cling so hard to the good things of life when I begin to lose the use and pleasure of them, I come to view death with much less frightened eyes," Montaigne wrote. "When we are led by Nature's hand down a gentle and virtually imperceptible slope, bit by bit, one step at a time, she rolls us into this wretched state and makes us familiar with it."

Nir Barzilai, the director of the Institute for Aging Research at the Albert Einstein College of Medicine, is sometimes credited with discovering the first "longevity gene," an unusual variation in DNA that is linked to exceptionally long life. When people ask him to define aging, however, he doesn't talk about that, and instead tells a two-sentence story. An elderly woman turns to her husband and says, "Honey, why don't we go upstairs and make love?" Her husband responds, "Sweetie, I cannot do both."

For decades, Barzilai has followed hundreds of Ashkenazi Jews and examined genetic, behavioral, and environmental factors that have helped

them age past ninety-five in exceptional health. Centenarians die of the same things as the rest of us, but later, he told me. You might live to a hundred if you could pick your genes—picking the healthy lunch option isn't likely to be enough. Strikingly, around half the centenarians in Barzilai's study have been overweight; thirty per cent of the women and sixty per cent of the men have been heavy smokers. When he asked a hundred-year-old whether anyone had warned her about the harms of tobacco, she responded, "Yes, all four of the doctors who told me to stop smoking—they died."

Attia tends to argue that individual choices matter not because they are all-powerful but because they are the power that we have. He compares healthy aging to investing in retirement: contribute what you can, whether it's a daily walk or an extra half hour of sleep, and the benefits may compound over time. "If I'm being brutally honest, I think some people are looking for a reason not to do it because it's hard," he said.

He acknowledged that health, like wealth, is unequally distributed; indeed, one of the most powerful longevity "medicines" is money, which can buy people less stress, better education, safer neighborhoods, and higher-quality medical care. For this reason, Emanuel argues that doctors should focus less on "getting rich people from ninety to a hundred" than on improving health in communities where people die young. When I asked Attia whether his practice might perpetuate this divide, he told me, "I've never concerned myself with that. I don't think it's unimportant, but it's absolutely not a problem I'm interested in addressing." He pointed out that his podcast is free and his book costs less than twenty dollars.

Attia has a term for his unproven ideas: evidence-informed medicine, or interventions that rest more on theory than on randomized controlled trials in humans. In his view, medical recommendations are often too conservative; in some cases, rigorous studies would not only take too long but also be unethical or impractical. (Try randomly assigning babies to ketogenic diets at birth.) According to Attia, medicine's admonition to do no harm is "sanctimonious bullshit" that steers doctors toward passivity and resignation. But this line of reasoning leaves enormous room for extrapolation, and could be used to justify almost any practice.

Talking to Attia, I frequently reminded myself that I can't diet and exercise my way out of many diseases, and there's no regimen to eradicate uncertainty. Still, I felt the pull of becoming an "athlete of life." Too often, conversations about life extension devolve into unhelpful abstractions and untestable speculation; one appeal of Attia's advice is that it's so tangible. Critics can paint his counsel as blindingly obvious or needlessly complex—but he has, at least, inspired large audiences to imagine what a better approach to aging could look like. "There is actually no such thing as atheism," David Foster Wallace once said. "The only choice we get is what to worship." In a society that chases money, power, fame, and beauty, there are worse gods than longevity.

Attia is a history buff and an avid rucker, which means that he likes to lug a heavy rucksack on long walks. In June, to mark the eightieth anniversary of D Day, Attia plans to set out from Utah Beach, in Normandy, with four friends, carrying supplies plus a twenty-five-pound weight, just because. They hope to trek eighty kilometres through the night and arrive at Omaha Beach less than twenty hours later.

During my visit, Attia agreed to take me on a gentler ruck, in the hills around his neighborhood. We had lunch delivered beforehand; he had a salad with chicken, nuts, and balsamic vinegar, while I had a saucy pasta. I caught him glancing at my bowl and imagined him judging my macronutrients. Then I changed into my workout gear and met him in his garage, where he outfitted me with an Army-green rucksack. "I generally recommend that people new to rucking start light," he said, and slipped a thirty-pound weight plate into my bag. He added a few to his own, and we set out into the afternoon sun.

After climbing a hill, we entered a clearing. Around us, a circle of oak trees stretched majestically into the air. A mild breeze cooled the sweat on my brow, and a flock of birds darted across the open sky. I considered stopping to look around, but I could hear the weights in Attia's rucksack clanging like a metronome, so I sped up. I was feeling pretty good; I made a mental note to offer to take one of his plates. I changed my mind after the next hill, when my neck stiffened and my shoulders started to hurt.

"Why not just go for a hike?" I asked, panting.

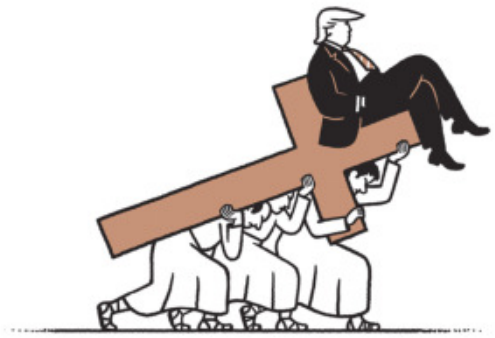
"I wouldn't find that as fun," he said. "Plus, it's not as good for your trunk."

In the distance, a school bus drove by. I envisioned myself lifting my hypothetical granddaughter one day, then adjusted my rucksack and straightened my posture.

As we walked on, I thought about a curious body of psychological research, which suggests that as we age and lose our capacities we tend to grow more content, not less. This finding clashes with popular conceptions of getting older, but seems to hold across continents, cultures, and eras. "I can't do everything I used to," a family friend, who is in his eighties and has been married for sixty years, recently told me. "But I wouldn't say I'm any less happy than I was before." Lost pleasures, he said, could sometimes be replaced: rounds of golf gave way to brisk walks, and when walking became difficult he spent more time talking to his children and grandchildren. As we grasp that our days are limited, we seem to abdicate our need for control; we may try to close the gap between what we want and what we have. Healthy aging seems to require a shift in mind-set as much as a shift in muscle mass.

My calves started to burn. I felt a knot in my back. White clouds veiled the sun, and a few ethereal rays came through. It looked so much like the entrance to TV Heaven that I half expected a deep voice to boom from above.

"Sometimes I think about all the people who've ever lived, and how lucky I am to be alive right now," Attia told me. "Like, if I died tomorrow, it would be O.K." We started down a final hill. His house came into view. "But, while I'm here, I want to know that I gave it my all," he went on. "We have this one shot. Wouldn't it be a shame if we didn't make the most of it?" ♦



STORIES FROM THE TRUMP BIBLE

BY BRUCE HEADLAM AND STEPHEN SHERRILL

Donald Trump is selling a "God Bless the USA" Bible for $60.

—*NPR, March 27th.*

The Great Flood

Now, Noah was very faithful, so God commanded him to build a mighty ark, telling him, "Take your family and two of every living thing." But there was one animal that Noah couldn't catch, and that was the beautiful unicorn, a white horse with a horn on its head. They're very tricky, those unicorns. They hid from Noah and perished in the flood.

Noah became very sad and spoke to God: "Lord, why have you forsaken the unicorn? Especially when you have other creatures here I don't care for, frankly."

After forty days, God kept his promise and the rain stopped. Noah and his family stepped out of the ark and into a new world. But he couldn't stop thinking about unicorns.

Imagine if we had unicorns today. Wouldn't that be something?

The Testing of Abraham

"Abraham!" God commanded. "Take your son to the mountain and make of him a sacrifice to me."

But Abraham had a multitude of sons by many wives. That's how they did it back then. Many wives. Some say it was better that way.

"Lord," Abraham replied, "can you tell me which son? I have so many."

"Your firstborn."

"Just the one, Lord? Really, there are so many I don't remember all their names."

"Just the one. It's not a big deal."

"Are you sure? Honestly, Lord, I can't find them all jobs as it is."

"O.K., fine. Take a couple."

"The firstborn and one other?"

"It doesn't matter. You choose."

Then Abraham was seized by fear, and beseeched the Lord: "Please spare my daughter. For I say unto you, she's quite a looker."

And God replied, "Let's just forget I said anything."

The Feeding of the Multitude

After Jesus finished preaching, a great multitude of people came to him with tears in their eyes, because it had been such a beautiful speech. But it was also very long, and they were hungry.

The apostles had only seven loaves of bread and a few fish. Jesus told them, "Collect money from the multitude for food. Then bring it to me and I'll show you a miracle." And because he liked to test his followers he added, "The apostle who brings the most money can ride with me on my donkey into Jerusalem."

When the apostles had done what he asked, Jesus broke the loaves and fish and put them into baskets. When the apostles saw what he had done, they cried, "Lord, there are still only seven loaves and a few fish. They're just in smaller baskets. That won't fool anybody."

Jesus put the money in his robe and said, "Tell the multitude if they go home now we've got something much better than loaves and fish for them. They're going to be very happy, trust me."

The apostles told the five thousand what Jesus had said and, lo, they were satisfied and left without eating. The apostles threw themselves on the ground and praised Jesus, for they had witnessed a miracle.

Afterward, Jesus didn't mention the donkey ride again, and nobody asked.

The Resurrection

After Jesus was arrested, the crowd brought him before Pontius Pilate.

"Tell me, Jesus Christ," Pilate said. "Are you King of the Jews?" Which wasn't that strange a question, because even today a lot of people don't know that Jesus was actually Jewish.

"You say that I am," Jesus replied, but, again, you couldn't tell just by looking at him. "This trial is very unfair. You are a corrupt judge, and your wife is a very nasty woman."

"What does my wife have to do with anything?" Pilate asked.

"I don't want to say," Jesus replied. "But I've heard some rumors."

The crowd dragged Jesus away, while Pilate pondered the comment about his wife. Jesus was crucified and left to die.

Overcome by grief, the apostles left for Galilee, where to their amazement they found Jesus in splendid white robes waiting for them.

"Lord!" they cried. "You have fulfilled the prophecies and risen from the dead."

"What prophecies?" Jesus replied. "I've been here the whole time."

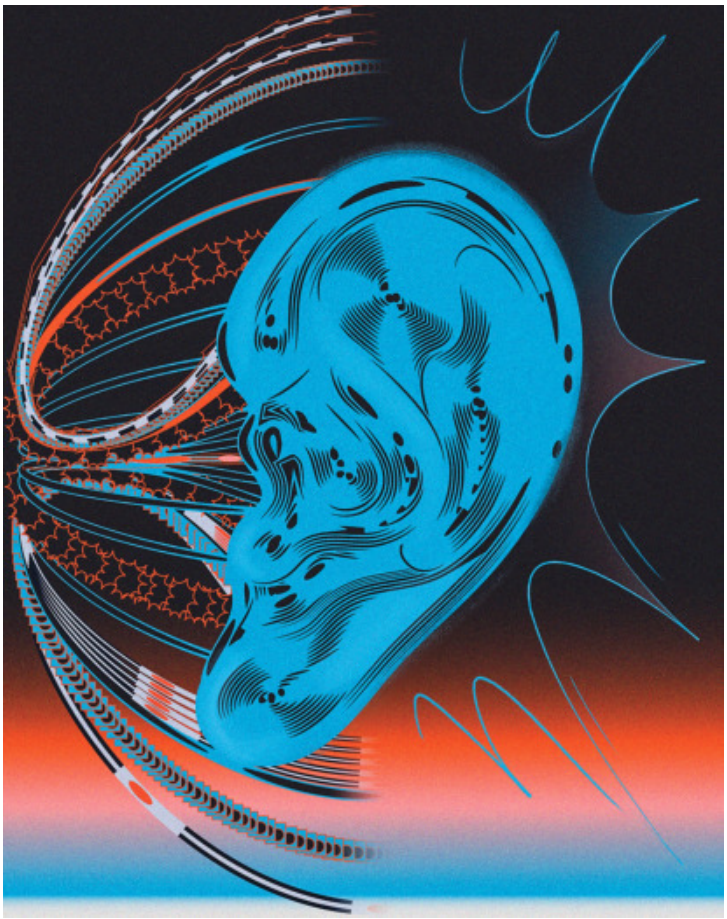
The apostles didn't understand.

"While I was carrying the Cross, someone stopped to help," Jesus said. "Simon. Shimon, maybe. Sounded foreign. The next thing I knew, the crowd had crucified him instead, so I just left."

The apostles exulted, and the sky opened up. "I am ascending to Heaven now to sit at the right hand of the Father," Jesus told them. "And when I return I'm not going to be in such a forgiving mood. Judas, the Pharisees, Pilate—they will feel my wrath on Day One. I'm not so happy with Thomas, either, who I heard said some very bad things about me. And this will be a sign unto you: the lamb will lie down with the lion. And you're not going to want to be the lamb, believe me."

With that, Jesus ascended to Heaven, speaking his final words: "I'll ask one more time about the unicorns. But I'm pretty sure the answer is still no." ♦

LUCI GUTIÉRREZ



ANNALS OF SOUND

WHAT IS NOISE?

Unpleasant sounds are a matter of perception—and control.

BY ALEX ROSS

"Noise" is a fuzzy word—a noisy one, in the statistical sense. Its meanings run the gamut from the negative to the positive, from the overpowering to the mysterious, from anarchy to sublimity. The negative seems to lie at the root: etymologists trace the word to "nuisance" and "nausea." Noise is what drives us mad; it sends the Grinch over the edge at Christmastime. ("Oh, the Noise! Noise! Noise! Noise!") Noise is the sound of madness itself, the din within our minds. The demented narrator of Poe's "The Tell-Tale Heart" jabbers about noise while he hallucinates his victim's heartbeat: "I found that the noise was *not* within my ears. . . . The noise steadily increased. . . . The noise steadily increased."

Yet noise can be righteous and majestic. The Psalms are full of joyful noise, noise unto the Lord. In the Book of Ezekiel, the voice of God is said to be "like a noise of many waters." In "Paradise Lost," Heaven makes "infernal noise" as it beats back the armies of Hell. Public Enemy's "Bring the Noise" marshals forces for a different kind of battle. At the same time, the word can summon all manner of gentler murmurs: "The isle is full of noises,/ Sounds and sweet airs." Tennyson speaks of a "noise of hymns," Coleridge of a "noise like of a hidden brook." In Elizabethan England, a "noyse" could be a musical ensemble, such as the one that supplied a "heavenly melodie" for Queen Elizabeth I's coronation pageant. Any hope of limiting the scope of the term evaporated when information theorists detached it from acoustics altogether and applied it to any ambient activity that hinders a signal. Noise has come to mean an engulfing barrage of data—less an event than a condition.

Other languages handle noise a bit less vaguely. In French, the most common term is *bruit*, which comes from the Latin for "roar." That's a straightforward description of what a noise sounds like, as opposed to a subjective assessment of how it might upset us. In German, *Lärm* tends to indicate louder noises, *Geräusch* softer, more natural ones. Russians have a range of words, including *shum*, which, according to Vladimir Nabokov, suggests "more of a swoosh than a racket." When Osip Mandelstam wrote of *shum vremeni*—"the noise of time"—he captured an essential texture of modern life.

Noise is capacious enough to have inspired a small and ever-growing library. Alongside various cultural histories—Bart Kosko's "Noise," David Hendy's "Noise," Mike Goldsmith's "Discord: The Story of Noise," Hillel Schwartz's nine-hundred-page "Making Noise"—you can read accounts of noise-music scenes ("Japanoise," "New York Noise"), noise-based literary criticism ("Shakespeare's Noise," "Kafka and Noise"), and philosophies of noise ("An Epistemology of Noise," "Noise Matters: Toward an Ontology of Noise"), not to mention practical-minded guides to reducing noise from your HVAC unit or reducing the noise in your head. How noise relates to music is a much bruited topic in itself. Samuel Johnson offers an elegant resolution: "Of all noises, I think music the least disagreeable." Music is our name for the noise that we like.

With a universal definition hovering out of reach, the discourse concerning noise often starts with the personal. My history with the thing is fraught: I hate it and I love it. As a child, I was extraordinarily sensitive to loud sounds. Family expeditions to Fourth of July fireworks displays or steam-railway museums routinely ended with me running in tears to the safety of the

My history with noise is fraught: I hate it and I love it.

ILLUSTRATION BY PETRA PÉTERFFY

car. When, in early adulthood, I moved into the noise cauldron of New York City, I was tormented by neighbors' stereos and by the rumble of the street. I stuffed windows with pillows and insulation; I invested in industrial-strength earplugs; I positioned an oversized window fan next to my bed. This neurosis has subsided, but I remain that maddening hotel guest who switches rooms until he finds one that overlooks an airshaft or an empty lot.

All the while, I was drawn to music that others would pay money to avoid. Having grown up with classical music, I found my way to the refined bedlam of the twentieth-century avant-garde: Edgard Varèse, John Cage, Karlheinz Stockhausen, György Ligeti. In college, I hosted a widely unheard radio show on which I broadcast things like Ligeti's "Poème Symphonique"—a piece for a hundred metronomes. When someone called in to report that the station's signal had gone down, I protested that we were, in fact, listening to music. Similar misunderstandings arose when I aired Cage's "Imaginary Landscape No. 4," for twelve radios. When I moved on to so-called popular music, I had ears only for the churning dissonances of Cecil Taylor, AMM, and Sonic Youth. I became the keyboardist in a noise band, which made one proudly chaotic public appearance, in 1991. At one point, my bandmates and I improvised over a tape loop of the minatory opening chords of Richard Strauss's "Die Frau Ohne Schatten."

Obviously, my issues with noise pivot on the question of control. When the noise occurs on my own terms, I enjoy it; when it's imposed on me, I recoil. This bifurcation is typical, even if I represent an extreme case. Garret Keizer, in his incisive 2010 book, "The Unwanted Sound of Everything We Want: A Book About Noise," observes that the noise/music distinction is ultimately an ethical one. If you elect to hear something, it is not noise, even if most people might deem it unspeakably horrible. If you are forced to hear something, it is noise, even if most people might deem it ineffably gorgeous. Thus, Keizer writes, "Lou Reed's 'Metal Machine Music' performed at the Gramercy is not noise; Gregorian Chant piercing my bathroom wall is."

"Unwanted sound" is the basic definition. An act of aggression is implied: someone is exercising power by projecting sound into your space. Sometimes the act is unconscious: people don't realize how loud their speakers are, or they assume that everyone loves their music as much as they do. Sometimes, though, it is a gesture of undisguised brutality. Late one night in 2002, I asked some frat-boyish neighbors to turn down their thumping techno. They responded by turning it up. When I complained again, one of them began shouting "Fucking faggot!" and hurling his body against my door. I lacked the presence of mind to remark upon the irony of homophobes blasting techno—in Chelsea, of all places.

We seldom reject the sounds of people we like. Disputes over noise expose social fissures. The classic cinematic study of music, noise, and violence is Spike Lee's "Do the Right Thing," in which Radio Raheem brings his boom box inside Sal's pizzeria, blaring Public Enemy's "Fight the Power." Sal says, "What did I tell you about that noise?" Radio Raheem protests, "This is music. My music." Minutes later, he is dead, the victim of a police killing.

The perception of hip-hop as "Black Noise"—the title of a 1994 book by the pop-culture scholar Tricia Rose—is part of a long history of sonic dehumanization directed at minority groups. The word "barbarian" originates from a disparaging Greek term, *bárbaros*, which appears to evoke the alleged gibberish of foreign peoples ("bar bar bar"). The musicologist Ruth HaCohen has tracked long-standing European perceptions of Jews as a peculiarly noisy people. "*Lärm wie in einer Judenschule*," or "noise as in a synagogue," remained a popular German expression into the Nazi period. (Mandelstam inverts those perceptions in "The Noise of Time," relishing the intricacy of "Jewish chaos.") Colonizers who disdained the weird sounds of native peoples overlooked the fact that they themselves were causing unprecedented levels of commotion—bells, trumpets, guns, cannons, machines. Noise enables power. As Keizer writes, it is a way of saying, "The world is mine."

Amid the hubbub of urban life, silence is a luxury of the rich. They can afford the full-floor penthouse apartment, the house that sits on a quiet acre. They can install triple-paned windows and pump insulation into the walls. They can, if they choose, become Proust in his cork-lined room. For the rest of society, noise is an index of struggle. Hendy's "Noise," which is based on a 2013 BBC Radio series, documents the ruckus of tenement living in eighteenth-century Edinburgh and the altogether hellish clamor inflicted on ironworkers in nineteenth-century Glasgow. A doctor wrote of a group of Glasgow boilermakers, "The iron on which they stand is vibrating intensely under the blows of perhaps twenty hammers wielded by twenty powerful men. Confined by the walls of the boiler, the waves of sound are vastly intensified, and strike the tympanum with appalling force."

The colossal cacophony of the Industrial Revolution prompted some of the first serious efforts at noise control. Often, these amounted to crabby élitism. Charles Babbage lamented the "organ-grinders and other similar nuisances" who were degrading the productivity of "intellectual workers." Charles Dickens signed a letter claiming that writers and artists had become "especial objects of persecution by brazen performers on brazen instruments." But the New York anti-noise activist Julia Barnett Rice, who founded the Society for the Suppression of Unnecessary Noise in 1906, transcended upper-crust narcissism by arguing that people of all backgrounds were suffering from excessive noise in schools and hospitals. She intuited what scientific studies later confirmed—that noise can inhibit learning and complicate health issues. It can also, of course, cause auditory damage, in the form of tinnitus, and hearing loss.

Attempts to mitigate and legislate noise levels run up against the challenge of adjudicating which sounds are excessive and unpleasant. Measuring loudness is itself a tricky business. The decibel scale, like the Richter scale, is logarithmic, and it accounts for quirky neural responses to changing stimuli. A twenty-decibel sound is generally perceived as being twice as loud as a ten-decibel one, yet the actual intensity is ten times greater. Furthermore, the decibel scale is customarily weighted to factor in additional peculiarities. We are more sensitive to upper frequencies

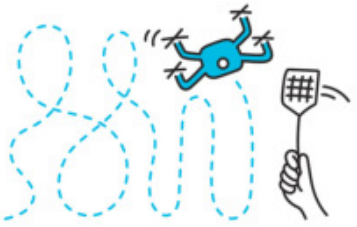
(a soprano is more conspicuous than a bass), to indoor sounds, to nighttime sounds. With all these complexities, noise codes, where they exist, are difficult to enforce. In 2022, New York City's Department of Environmental Protection received nearly fifty thousand complaints but imposed monetary penalties in only a hundred and twenty-three instances.

Emergency warnings—foghorns, locomotive whistles, ambulance and fire-truck sirens, air-raid sirens—fall into a special category of necessary, life-saving noise. Car horns are a borderline case: sometimes they stave off disaster, but more often they foster road rage. Matthew F. Jordan's "Danger Sound Klaxon!: The Horn That Changed History" studies one of the most purposefully obnoxious noises of modern times—the "aa-OOO-gah!" honk that became ubiquitous on American roads in the early twentieth century. In a free-for-all traffic environment, drivers alerted pedestrians and other vehicle operators by using the horn incessantly. Ads for the Klaxon—invented by the electrical engineer Miller Reese Hutchison, and introduced in 1907—boasted of its ability to "CUT THROUGH AND KILL musical sounds." Raw panic was the aim. During the First World War, the Klaxon was used to warn of gas attacks; it then declined in popularity, partly because traumatized veterans reacted poorly to its squawk.

We humans have a high tolerance for noise, despite our ambivalence. In some way, we seem to require it. Other species feel differently about the never-ending sonic havoc of the Anthropocene. Caspar Henderson, in "A Book of Noises: Notes on the Auraculous," points out that when our species stayed mostly indoors during the early months of the COVID pandemic the animal world reacted with apparent relief: "Birdsongs regained qualities that had last been recorded decades before, when cities were quieter. The white-crowned sparrows, for instance, extended their sounds back down into lower frequencies . . . and their songs became richer, fuller and more complex." Birds also sang more softly: they "had been 'shouting,' just as people raise their voices on a construction site or at a noisy party." Their stress levels likely declined. Noise is another dimension of humanity's ruination of the natural world.

The inexorable advance of technological noise in the twentieth century—cars, airplanes, helicopters, pile drivers, lawnmowers, leaf blowers, home stereos, stadium sound systems—left the impression that the world was getting louder year by year. This may well have been so, but in recent decades there has actually been a levelling off, or even a decline, in certain types of noise. Jet engines are less thunderous than they were in the seventies. The increasing popularity of electric vehicles has brought about a situation in which cars can be dangerously inaudible to pedestrians. (Artificial engine noise has become a feature of electric models.) People now routinely listen to music on laptops and headphones, reducing incursions of bass.

These modest gains are offset by the rise of informational noise, which further blurs the meaning of the already confused parent word. Chen-Pang Yeang's "Transforming Noise: A History of Its Science and Technology from Disturbing Sounds to Informational Errors, 1900-1955" is thick with mathematical equations, yet it still tells an interesting story even for those of us who will skip the more technical pages. Beneath the vehicular roar in the years around 1900 was a simmering new electronic sound, native to the



telephone, the phonograph, the radio, and other forms of transmission and reproduction. Yeang describes this noise as "disturbances and fluctuations of electrical current due to the movements of microscopic charge carriers in electronic tubes and other circuit components." Such sounds weren't aggressively unpleasant, yet they hampered the communication of messages, verbal or musical. Scientists and engineers set about studying this electronic sizzle and figuring out how to reduce it.

The investigation soon intersected with ongoing inquiries into the movement of gas and liquid particles. Einstein's papers on Brownian motion, between 1905 and 1908, not only established the existence of atoms; they also helped to systematize the discipline of statistical mechanics, which describes patterns of random fluctuations over time, also known as stochastic processes. Defense work during the Second World War adapted those insights to military ends: devising uncrackable cryptography, resisting signal jamming, reducing interference in anti-aircraft radar systems. Claude Shannon, the founder of information theory, took an even more significant step by demonstrating how a signal can cope with a "noisy" channel—literally or figuratively—if it behaves in a noisy, stochastic way: by spreading itself across a broad spectrum, it transmits more effectively. That insight underpins modern cellular and wireless communications. It was a curious extension of the logic of the Klaxon: in a world full of noise, you punch through by making noise at a superior level.

Soon enough, the concept of stochastic noise, often simplified to the point of vanishing, achieved currency in a dizzying array of fields. Noise studies of recent decades examine perturbations in the stock market (the economist Fischer Black's paper "Noise"), unreliable patterns in decision-making (Daniel Kahneman, Olivier Sibony, and Cass Sunstein's "Noise: A Flaw in Human Judgment"), and irregularities in political polling (Nate Silver's "The Signal and the Noise"). The proposed corrective for such errancy is, very often, the dreaded algorithm. Kahneman and company argued that algorithms, being "noise-free," can "outperform human judgment." Machine-learning protocols in artificial intelligence, meanwhile, rely heavily on stochastic processes. The ultimate import of much of this work is that humans are themselves randomly fluctuating particles whose behavior, in aggregate, can be forecast by probabilistic methods.

Yeang helps out the mathematically illiterate by offering a literary frame for noise's semantic shift. In his intro-

duction, he juxtaposes a nineteenth-century account of invasive sound—Nathaniel Hawthorne's dismayed reaction to a train whistle—with the Reagan-era data-scape of Don DeLillo's "White Noise," with its swarm of "words, pictures, numbers, facts, graphics, statistics, specks, waves, particles, motes." White noise is a sound field in which all frequencies are equally intense. When the married couple at the novel's center, Babette and Jack, have a conversation about death, the crack of doom becomes a wash of static:

> "What if death is nothing but sound?"
> "Electrical noise."
> "You hear it forever. Sound all around. How awful."
> "Uniform, white."

White noise is the master noise in which all other noises drown. The perpetual swirl of cultural particles mutes the resonance of any individual voice. The irony is that the atomized buzz common to so much late-twentieth-century technology—fax machines, dial-up modems, the hiss between stations on a radio dial, the "Poltergeist" snow of a TV left on overnight—has largely faded. Such noise now resides in our minds, as we fend off notifications, updates, "Just for You" suggestions, consumer-feedback requests, obscene spam, clickbait headlines, A.I.-generated news stories, A.I.-generated news stories about A.I., and the whole silently screaming rest of it.

From time to time, nature unleashes a noise so immense that it restores the Biblical grandeur of the word. Many books on noise mention the Indonesian volcano Krakatoa, which, in August, 1883, disgorged what is commonly called the loudest sound in modern history. The eruption was audible from as far as three thousand miles away. The captain of a British ship that was forty miles distant wrote, "So violent are the explosions that the eardrums of over half my crew have been shattered. My last thoughts are with my dear wife. I am convinced that the Day of Judgment has come."

In October, I went to the Brooklyn experimental-music venue ISSUE Project Room to hear "VirtuAural Electro-Mechanics," a fifty-minute-long audio collage by the sound artist Francisco López. The performance space—a cavernous Beaux-Arts gallery that McKim, Mead & White had originally designed for the Elks organization—was plunged into darkness. Attendees were given masks to cover their eyes. In a program note, López writes, "This creation was developed from a myriad of original sound recordings of mechanical machines, electro-mechanical systems and industrial environments gathered over the past 25 years all over the world; from food factories to 'white rooms,' from 18th-century automata to computers, from wood and wires to magnetism, from the microscopic to the monumental."

If you demand that music provide an oasis of melodious sweetness, "VirtuAural Electro-Mechanics" would not be for you. It is an experience of overwhelming density. Loudness is not its chief characteristic—any average rock show or dance club would outdo it in decibels—but it covers such a vast range of frequencies and timbres, from lung-shaking bass tones to a tintinnabulation in stratospheric registers, that the brain struggles to assimilate the entirety of it. I imagined phantom structures in the air: the sound was bleeding into my other senses.

Is "VirtuAural Electro-Mechanics" music? In the usual sense, no. The Oxford English Dictionary associates music with "beauty of form, harmony, melody, rhythm, expressive content, etc.," implicitly excluding machines in food factories. The great German physicist Hermann von Helmholtz, in his 1863 tome, "On the Sensations of Tone," frames music as the opposite of noise. A musical tone, Helmholtz writes, is a "perfectly undisturbed, uniform

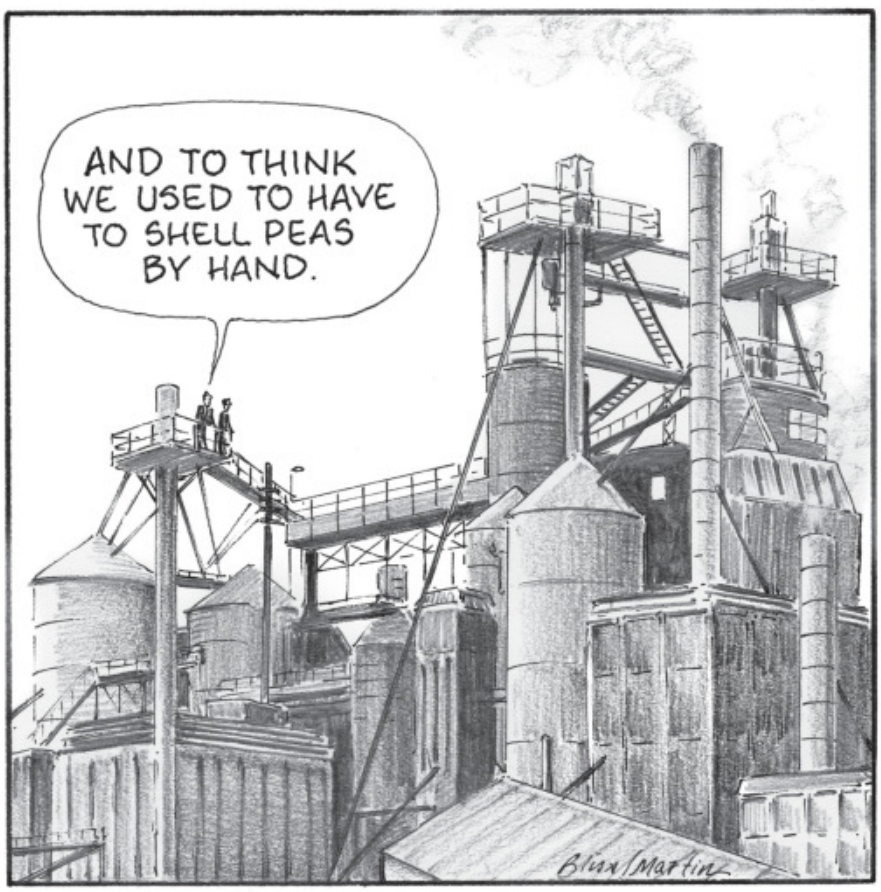
"I bring you I.P."

• •

sound." Noise is a jumble of rapid, irregular signals. Certain combinations of tones are more pleasing than others, on account of physiological principles that Helmholtz charts in extraordinary detail. European composers have perfected the art of harmony—creating, it would appear, a bulwark against noise.

In this same period, though, composers began to have different ideas. Like birds, they were listening to the world around them and mimicking its increasingly raucous character. In Wagner's "Das Rheingold," the subterranean smithy of the Nibelungs is evoked by a percussion section that includes, according to the score, eighteen anvils. For a few bars, the orchestra stops playing and the anvils hammer away on their own—industry incarnate. Harmony, meanwhile, was drifting from its tonal moorings: fearsome dissonances in the music of Mahler, Strauss, and Scriabin suggested both the outer density of modern life and the inner turmoil of the individual. Mahler said, "If we want thousands to hear us in the huge auditoriums of our concert halls and opera houses, we simply have to make a lot of noise [*Lärm*]."

Matters came to a head in 1913. The brutish chords that stomp through the second section of Stravinsky's "Rite of Spring" pack seven of the twelve notes of the Western chromatic scale into a confined space: as a result, pitch becomes a blur. T. S. Eliot later wrote that the "Rite" seems to "transform the rhythm of the steppes into the scream of the motor horn, the rattle of machinery, the grind of wheels, the beating of iron and steel, the roar of the underground railway . . . to transform these despairing noises into music." On March 31, 1913, two months before the première of the "Rite," a concert in Vienna featuring works by Arnold Schoenberg and his circle let loose an even more disturbing sound. In Alban Berg's orchestral song "Über die Grenzen des All," or "Beyond the Limits of the Universe," the winds and the brass intone a soft, unearthly sonority in which all twelve pitches are heard. This is an instrumental approximation of white noise, long before the term had been coined. The concert promptly devolved into a riot, one that even the famous uproar around the "Rite" could not equal. Fisticuffs broke out, the police were called, and a lawsuit ensued.



In that same year of discord and scandal, the Futurist painter Luigi Russolo published a manifesto titled "L'Arte dei Rumori" ("The Art of Noises"), in which he wrote, "For years, Beethoven and Wagner have deliciously shaken our hearts. Now we are fed up with them. This is why we get infinitely more pleasure imagining combinations of the sounds of trolleys, autos and other vehicles, and loud crowds." To that end, Russolo and his brother Antonio devised a battery of homemade noise instruments. A recording from 1921 suggests a café band tootling away in a room with bad plumbing. Other composers made more persuasive ventures: solo-percussion works by Amadeo Roldán and by Edgard Varèse, early electronic experiments by Paul Hindemith and by Oskar Sala, noise collages by the young John Cage. Varèse's mammoth orchestral piece "Amériques," which descended on Carnegie Hall in 1926, conjures the full pandemonium of the metropolis, with a New York Fire Department siren filling out the orchestra. George Antheil, in his "Ballet Mécanique," which arrived at Carnegie the following year, called for airplane propellers whirring onstage, though he had to settle for electric fans.

As Yeang notes in "Transforming Noise," Antheil played a cameo role in the evolution of stochastic research. During the Second World War, he assisted the Hollywood star Hedy Lamarr, an Austrian émigré with a mathematical gift, in designing a frequency-hopping technology that would have prevented the jamming of torpedo-guidance systems. Nothing immediately came of the Lamarr-Antheil scheme, though it forecast later breakthroughs. After the war, the engineer turned composer Iannis Xenakis transformed stochastic process into musical language. The instrumental lines of his 1955-56 score "Pithoprakta" are explicitly modelled on Brownian motion. Ligeti's "Poème Symphonique," from 1962, does something analogous. At first, the hundred metronomes generate a uniform cloud of indistinguishable ticktocks. Then, as one device after another winds down, the remaining voices become audible. In performance, the "Poème" begins as a comedy and

ends as a tragedy—an emblem of a dying ecosystem.

Noise enriched popular music, too. Jazz musicians, extending the blues tradition, activated pitches outside the standard twelve-note gamut. The sirenlike sneer of the trombone glissando became a signature sound. Jazz not only cut through the crackle of surface noise but also thrived on it. The emergence of a full-blown jazz avant-garde, after the Second World War, brought musical modernism to an exuberant peak. Rock entered its noise-art phase in the seventies and eighties, with the industrial grind of such bands as Throbbing Gristle and Einstürzende Neubauten. Hip-hop manipulated noise from the outset. Hank Shocklee, Public Enemy's master producer, echoed the rhetoric of Varèse and Cage when he said, "We believed that music is nothing but organized noise. You can take anything—street sounds, us talking, whatever you want—and make it music by organizing it. . . . This thing you call music is a lot broader than you think it is."

Supreme among noisemakers is Yoko Ono, who first made her name as a principled provocateur in the downtown New York scene—next to her, Cage looked timid—and then shot to global fame through her relationship with John Lennon. Her furiously nuanced screaming of the word "why" at the beginning of "Yoko Ono/Plastic Ono Band," from 1970, was a masterly act of one-upmanship in the face of the masculinist assault of mainstream rock and roll. Beatles fans, confronted with noise of a higher order, were as aghast as the socialite aristocrats who booed "The Rite of Spring." Noise is only one part of Ono's mercurial practice—she is equally drawn to meditative gentleness—but she deserves a central place in histories of the genre. For the most part, she has been left out of them.

Implicit in the art of noise is a promise of resistance. For millennia, music has been a medium of control; noise, it follows, is a liberation. Schoenberg went so far as to speak of the "emancipation of the dissonance," making his harmonic innovations sound like a civil-rights matter. The social theorist Jacques Attali, in his 1977 book, "Noise: The Political Economy of Music," put a sophisticated spin on that argument. The *bruit nouveau* that Attali hears emerging from free jazz and the European avant-garde has a revolutionary import: it denies the marketplace, it refuses popular taste, it involves "inventing new codes" and "playing for one's own pleasure." Subsequent treatises, such as Paul Hegarty's "Noise/Music," have maintained Helmholtz's duality while reversing its biases, so that noise heroically destroys music's stifling banalities.

The question is: Resistance to what? Nothing about noisemaking guarantees personal or political virtue. Russolo, like many other members of the Futurist movement, found a way to reconcile his bourgeois-bashing ideas with Fascist aesthetics. Varèse was tainted by racism and antisemitism. In more recent decades, Nazi iconography and vocabulary have adorned noise records by Whitehouse and Boyd Rice. The magisterial Japanese noise artist Masami Akita, who has released hundreds of implacably obliterative recordings under the name Merzbow, has shown self-awareness about this mentality of domination. "Sometimes I would like to kill the much too noisy Japanese by my own Noise," he has said. "The effects of Japanese culture are too much noise everywhere. I want to make silence by my Noise. Maybe that is a fascist way of using sound."

Stephen Graham, who teaches courses on underground music at Goldsmiths, in London, takes a different tack in "Becoming Noise Music," a survey of the field since the seventies. Aware of the murkiness surrounding the notion of resistance, Graham focusses instead on the genre's aesthetics. Furthermore, the opposition of "noise" and "music" dissatisfies him: the appeal of this grittiest of genres lies precisely in the erasure of the boundary between the two. There is no way of talking about noise without taking pleasure into account. The pleasure may be confined to a niche audience, and perhaps a somewhat masochistic one, but it exists all the same. No one chooses to listen to a sound because of what it is not.

How do you articulate the aesthetics of a music that follows a logic of dumbfounding excess? Graham makes a good stab in some pages devoted to Merzbow's album "Noisembryo," from 1994. He begins by observing, somewhat dryly, that the listener is "confronted with a kind of chaotic 'order' or musicality flickering into and out of existence as, say, a steady pulse pattern emerges, or an oscillating bass drone throbs into existence, or a panrhythm of clashing noise layers suddenly locks into polyrhythmic place." He then switches to stream-of-consciousness italics to convey the rush of surrender: "*I flow into the beating world, staying there as the music keeps changing and pulsing; it's possible to transcend—trance—in this way with more conventional music, but the low rate of repetition and high rate of density and strangeness in noise means that such trancing can have a particularly rich tensile quality when it's achieved. . . . This music takes me out of (my) self and makes me cosmic.*"

Such effusions are a bit embarrassing to read—but any critic who wishes to capture pleasure must embarrass the reader sooner or later. I experience feelings similar to Graham's when I lose myself in exemplary spells of musical noise, whether it's Merzbow, Ono, the apocalyptic war scenes in Chaya Czernowin's opera "Infinite Now," or the Krakatoan subwoofer frequencies of Ash Fure's installation "Hive Rise." The thrill I get from such sounds doesn't contradict my abiding love for Bach, Schubert, and Brahms any more than the abstract frenzy of a Jackson Pollock contradicts the radiant calm of a Fra Angelico. What I love about noise is its insistence on otherness, on difference. If music were ever to become a universal language, it would be dead.

As for López's "VirtuAural Electro-Mechanics," it left me in a state of happy vacancy, as if the digital detritus in my brain had been swept away. Yet I had been engaged in active, alert listening. I'd been nodding and swaying in time, even when no beat was apparent. The colliding pulses seemed to coalesce into a fundamental ghost rhythm that was as insistent as any pounding bass. The mind is its own place, as Milton's Lucifer says. It can establish its own order, its own harmony. I walked out into the streets of Brooklyn feeling alive, serene, peculiarly free. When I entered the screech of the subway, though, I winced and put on noise-cancelling headphones. ♦

By 2030, customers could have access to self-driving, electric air taxis that travel between neighborhood "vertiports." One

A REPORTER ALOFT

FLIGHT OF FANCY

Flying cars have long been a symbol of a future that never came. Are they finally here?

BY GIDEON LEWIS-KRAUS

company promises a seven-minute trip from Manhattan to an airport for the price of a rideshare.

PHOTOGRAPHS BY BALAZS GARDI

A little more than a decade ago, Founders Fund, a venture-capital firm run by the entrepreneur, investor, and political gadfly Peter Thiel, issued a proclamation called "What Happened to the Future?" As an investment thesis, it was underwhelming—it advanced biotechnology, energy, and the Internet as smart bets—but it was received as something of a spiritual treatise. Thiel was best known for his early investment in Facebook, but he believed that the nation had become sluggish. We might have been attempting to terraform nearby planets or surmount death. Instead, we made apps. His statement belonged to the genre of the writer F.T. Marinetti's Futurist Manifesto of 1909, which proposed that Italy's moribund museum culture be razed in favor of a machine cult of speed and steel: "We are going to be present at the birth of the centaur and we shall soon see the first angels fly! We must break down the gates of life to test the bolts and the padlocks! Let us go! Here is the very first sunrise on earth!" Thiel, no poet, was punchier: "We wanted flying cars, instead we got 140 characters."

"Where's my flying car?" quickly caught on as a meme in Silicon Valley and beyond. For Thiel, one culprit was obvious: regulators. In a contentious debate, he told Eric Schmidt, then the executive chairman of Google, that Schmidt was doing "a fantastic job as Google's minister of propaganda," but that the company had capitulated to an ethos of caution. "We've basically outlawed everything having to do with the world of stuff, and the only thing you're allowed to do is in the world of bits," he said. The economist Tyler Cowen offered a more neutral assessment in his book "The Great Stagnation," writing that perhaps "the low-hanging fruit has been mostly plucked." The complaint found surprising allies. The late anthropologist David Graeber, who at the time had no clue who Thiel was, wrote, "A secret question hovers over us, a sense of disappointment, a broken promise we were given as children about what our adult world was supposed to be like." The question? "Where, in short, are the flying cars? Where are the force fields, tractor beams, teleportation pods, antigravity sleds, tricorders, immortality drugs, colonies on Mars?" Graeber blamed bureaucratic risk aversion and corporations concerned only with short-term capitalist incentives. By 2020, when the investor Marc Andreessen grumbled, in one of his routine tirades, that we still didn't have flying cars, it felt almost dutiful.

While one segment of Silicon Valley lamented the perpetual absence of flying cars, another, it turns out, was quietly building them—or, at least, something flying-car adjacent. Just three months after the Founders Fund manifesto appeared, a Canadian inventor named Marcus Leng invited his neighbors and a couple of friends to his rural property, north of Lake Ontario. Leng was in his early fifties, with a bowl cut of coarse graying hair. He instructed his guests to park their (conventional) cars in a row and cower behind them. He strapped on a helmet and boarded a device that he'd built in his basement. It had a narrow single-seat chassis and two fixed wings, one in front and one in back, each with four small propellers. It was at once sleek and ungainly, as if a baby orca had been hitched to two snowplows. Observers described it, for lack of a better comparison, as looking like a U.F.O. Leng called it the BlackFly.

Leng, who had been flying since he was a teen-ager, had long dreamed of the "perfect aircraft"—something "that didn't require a pilot's license, and could take off or land anywhere." He'd paid close attention to past designs but suspected that their propulsion systems were too heavy, too complex, and too unresponsive. In the previous few years, however, he'd noticed that full-sized remote-control airplanes had all of a sudden become very good: they had enough power to hover and could be controlled with precision. It was nevertheless an entirely different thing to put a person inside one. He told me recently, "The original had no redundancy built into it at all, and any single point failure would result in a total failure. It was fundamentally unsafe." At his demo, the BlackFly's propellers came online with a whine, then a purr, and it lifted into a hover about a metre off the ground. He pitched forward, in the direction of his guests. He'd thought that he would pivot into a skidding stop, in the manner of a skier. As he initiated a banking turn, though, the edge of one wing caught on the lawn. "I thought, This is not going to end well," he said. But the craft held steady, dug a curving divot through thirty feet of grass, and came to rest. The trip lasted about twenty seconds. It was, as far as anyone knew, the first manned flight in an "electric vertical takeoff and landing vehicle," or eVTOL (pronounced "ee-*vee*-tall").

Today, there are more than four hundred startups in what is called the "advanced air mobility" industry. The term covers everything from actual flying-car-ish contraptions to more traditional-looking airplanes, but it generally refers to eVTOLs. For the most part, these crafts bear a greater resemblance to helicopter-plane hybrids than to automobiles, and they can't be driven on the road; they might better be described as electric aerial vehicles with the ability to hover and the no-fuss point-to-point flexibility of a car. Some are single-seat playthings: Jetson One, a Swedish company, has developed a craft that looks like a little aerodynamic cage and handles like Luke Skywalker's X-wing. Others fly themselves: EHang, a Chinese company, has been testing an autonomous passenger drone with a quadcopter design. (Its Chinese name translates to Ghost Intelligent Aerial Robot.) The first widespread use will be for air taxis—initially with pilots, then without—that will move passengers between neighborhood "vertiports." Matthew Clarke, a postdoctoral fellow in aeronautical engineering at M.I.T., said, "In a best-case scenario, we're seeing certification in two years and flying two or three years after that." The 2028 Summer Olympics, in Los Angeles, may feature the ferrying of athletes through the air from the village to their stadiums. Regular civilians, or at least the courageous among them, could have access to such services by the end of the decade. One company promises a seven-minute trip from Manhattan to an airport, with an aspiration to land inside security; seat prices would eventually be competitive with rideshares. Proponents imagine a system of cheap, sustainable aerial transit—ribbons of humming vehicles interlaced overhead.

Leng's company, now called Pivotal, occupies a few nondescript buildings on the marshy end of Palo Alto, wedged in behind Google and a NASA research center. The company recently began selling the BlackFly to hardy individuals. It has the footprint of a monster truck, but it

weighs less than three hundred and fifty pounds. This past January, Kristina Menton, Pivotal's C.O.O., welcomed me to the company's training center, a miniature flight school for prospective customers. There was a foyer with a sweeping C.G.I. panorama of the aircraft in flight over a rocky Pacific coastline, a cavernous showroom with a single demonstration vehicle, a classroom, and the all-important simulator chamber. Menton, who served as a test pilot in the early days, told me, "Back then, it was terrifying. You did months of training for thirty seconds of flight, with fifteen people there to support you. Now we just want to get more people in the air." She added, "Everybody comes down from their first flight and has the same exact face, just the pure joy of flight."

Pivotal's aircraft is permitted under the Federal Aviation Administration's special carve-out for "ultralights," a concession to the reality that the government cannot plausibly prevent you from fastening a lawnmower engine to a kite and barnstorming over your back yard. Ultralight pilots are not subject to any training requirements. The Pivotal team is aware, however, that just one crash might render the company's trajectory unrecoverable, and potential customers are expected to complete a two-week program at its training center. Meals are catered.

Before I arrived, the company's P.R. person called to ask if I exceeded the pilot's weight limit of two hundred pounds. The team had recently developed an abbreviated curriculum that took less than a week, and they invited me to try my luck. If at the end they deemed me sufficiently unlikely to die, and take the company with me, they would greenlight me to fly. My odds of success, she noted, were likely to correlate with my aptitude for video games. My small children were resolutely enthusiastic about the endeavor, my wife somewhat less so.

The training setup looked like a dentist's chair, with two joysticks and a virtual-reality headset. A software engineer at the company reminded me that this equipment could afford to be a little janky: "A sim can't fall out of the sky." The actual BlackFly has the glide ratio of a dishwasher; a catastrophic failure would entail a direct plunge to the ground. As I hesitated at the entrance to the training room, Menton tried to reassure me. "The simulator is good," she said. "The simulator *has* to be good. Because even your first flight is a solo."

A few years ago, the technologist J. Storrs Hall published a manifesto called "Where Is My Flying Car?," one of the few recent cultural artifacts that takes the question seriously rather than symbolically. Storrs Hall's story begins not with the fanciful flying cars of the future but with those of historical record. In the nineteen-twenties, a Spanish aeronautical genius named Juan de la Cierva invented something called an autogyro, a kind of low-rent helicopter precursor. The vehicles fell to earth a lot, but their passengers frequently survived. Unfortunately, the engineer himself died as a passenger in an unrelated plane crash. In the thirties, Waldo Waterman sold a handful of Aerobiles, cars with removable wings and a road-ready fuselage. Machines like these might have been unwieldy, but the concept seemed within reach, especially once so many veterans returned from the war with pilot training. The aviation company Cessna ran magazine advertisements for the Family Car of the Air, a sensible little plane that you could park in your garage, with copy like "Remember, Mrs. America likes to go places and see things. And when she finds out that she can cover 600 miles in a morning, to shop or visit in any one of a dozen cities, she's *going to fly*."

By the mid-fifties, it was almost a given that some future sedans would come with wings. If we were going to live in mile-high space needles, how else would we move about? The title sequence of "The Jetsons," which premièred in 1962, doesn't show the ground once; George takes his wife and children to their respective floating platforms in his domed airship, and then heads to his office at Spacely Space Sprockets, Inc. (Storrs Hall estimates that George has a 1,341-horsepower vehicle, which draws on the equivalent of a thousand pounds of jet fuel.) Some of this imagery was the standard-issue utopianism of the bright-eyed mid-century, but it really wasn't *that* far-fetched. After all, many of the era's predictions came to pass: portable radios, televisions with screens "the size of a pocket handkerchief," air-conditioning, plastics. "The Jetsons" more or less foretold the invention of the Roomba. And flying cars were already being built. The Aerocar had wings and a tail that could be stored in a trailer. The ConvAirCar

The BlackFly was used in what may have been the first manned flight of an eVTOL.

had an airplane attachment that could be rented at an airport. But the flying car was always something of an engineering chimera. Ideally, cars grip the road's surface rather than depart from it—a spoiler is the opposite of a wing. Most pure flying-car designs have been jury-rigged compromises between a lousy automobile and a stupid airplane. The ConvAir-Car's test pilot ran out of gas in the air—he'd been looking at the automobile's fuel gauge rather than the airplane's—and crashed; he survived, but the project did not. The military continued to experiment with things like the AirGeep, a small craft that didn't require a runway. But, for the most part, the dream of a flying car was dead by the late seventies.

For Storrs Hall, this was not inevitable. He lays out several interlocking reasons for our supposed technological stagnation, but the gist is that, as a society, we've lost our taste for Promethean ambition—flying cars fell victim to "the wave of hostility and suspicion of technology" that swept America. In 1973, the F.A.A. banned the Concorde from flying over the United States, citing noise concerns. Storrs Hall argues that it was the ban itself that prevented the development of quieter supersonic flight. He sees a similar mentality at work in the retreat from nuclear power, which seemed, well into the nineteen-seventies, like the obvious successor to fossil fuels. But after the core meltdown at Three Mile Island, in 1979, despite the fact that there were no documented fatalities, it became almost impossible to build new nuclear plants in the United States. This now looks like a mistake.

For theorists of stagnation, flying cars were another victim of our unwillingness to bear the costs of progress. It's often remarked upon, in boosterish circles, that American society allows about forty thousand road fatalities a year but refuses to tolerate even one aviation death. Storrs Hall told me, of the F.A.A., "Why can't they say, 'If you want to develop a flying machine, go out in the desert and do whatever you want'? I remember when Amazon was trying to test drone delivery they had to do experiments in Canada." In the sixties, a heliport was built atop New York City's Pan Am Building. After a period of inactivity, it was put back into use in 1977, with as many as sixty-four scheduled departures each day to local airports. That May, there was a landing-gear failure. Four people were killed by spinning rotor blades; a fifth was killed by a blade that careened to the street below. The heliport was permanently closed.

This story, as an explanation for why we don't fly out of our driveways, is both true and incomplete. It's also the case that the contours of aviation had begun to change. By the eighties, flying your own little plane had grown so expensive that the activity shifted from being useful to being a hobby. At the same time, commercial aviation became not only vastly cheaper but also less and less likely to kill you. Fifty years ago, planes went down all the time. The most recent fatal crash of a domestic commercial jetliner was in 2009. For aviators, this is nothing short of a miracle. We didn't panic and retreat from

technology; we panicked and improved it. But, for decades, we didn't have the advances required to make a personal flying machine that would be stable, easy to use, and cost-efficient. And the safety concerns are strongly felt. "There's this different limbic-system response" to flight, Cyrus Sigari, a pilot and a prominent investor in advanced-air-mobility companies, said. "Everything in our bodies tells us that it's not normal, so the strong reaction we have to plane crashes, as a society, is 'Hey, I told you we're not supposed to be in the air, and you went in the air and crashed.'"

Then, about fifteen years ago, a lot of people simultaneously noticed that several relevant technologies had caught up with us. In 2010, Larry Page, a co-founder of Google, had Sebastian Thrun, a German engineer, over for dinner. Thrun ran Google X, the company's Skunk Works, and he was one of the world's foremost developers of autonomous vehicles. Page produced a spreadsheet of calculations, which Thrun described as "similar to what Elon used to argue the correctness of Tesla." Batteries had become better and lighter, and electric propulsion systems dramatically more powerful. New sensors had improved autonomous capabilities. Page's calculations showed that there were newly viable methods to get into the air and stay there. "We thought it might even invalidate self-driving cars, because, all things being equal, you'd rather fly than drive," Thrun said. They decided that this was too experimental a project for Google—self-driving cars were one thing, but flying ones? "Larry said, 'O.K., I'll do it myself.'"

In the next few years, Page secretly funded multiple companies—including one called Zee.Aero and another, run by Thrun, called Kittyhawk—that functioned as a kind of distributed research-and-development shop. His initial idea was to build a self-driving flying machine that could take off from and land in a parking space. He had an array of corporate jets, but presumably the trip to the airport was still annoying. In the first five years, he put more than a hundred million dollars of his own money into one company alone. Page, who initially kept an apartment above one of the design hangars, was never referred to by name; he was called Gus, for "the guy upstairs." One team had trouble sourcing batteries, so Page bought ten motorcycles off a lot and stripped them for fuel cells. Some engineers couldn't secure access to a wind tunnel, so they put their prototype on an exposed train car to Southern California. It was a bit of a madcap scene. At one point, a team of engineers devoted themselves to their entry in Red Bull Flugtag, a contest in which participants take a running leap off a pier and glide as far as they can. (The team set a record, which still stands, using the wing design from its vehicle.) By 2014, the team's proof-of-concept craft had completed more than two hundred successful test flights. Word began to get out, and planespotters skulked around outside the hangars, trying to get a glimpse of Page's unearthly machines.

Soon enough, these successes ushered in an entire industry. Airbus spent four years developing an eVTOL prototype. A German company raised an enormous amount of money for a craft that was later rumored not to work. Storrs Hall attributed the sudden flourishing of flying machines to the prevalence of drone technology in everyday life, and to a greater mood of optimism about technology: "The whole Zeitgeist has changed a bit, and people are beginning to say, 'Why aren't we landing on the moon anymore?'" Page spread his bets around. Three years after Leng's maiden voyage, Pivotal got funding from Page and moved to Silicon Valley. In 2022, a former drone executive named Ken Karklin came aboard as C.E.O. He told me that, when he took the job, he got a call from Chris Anderson, a former editor of *Wired* and later the C.T.O. of Kittyhawk, to say, "Welcome to Larry Page's air force."

Pivotal's simulator room is a carpeted space with an azure accent wall, a couch for resting, and a snack table. The simulator chair rotates only on one axis—nose up or nose down—to capture the vehicle's jarring ascent. Some eVTOLs use two sets of propellers, one for lift and one for thrust. Others use a tilting mechanism—imagine if a helicopter rotor rotated forward to become a propeller. The BlackFly is unusual: the entire vehicle rears back nearly ninety degrees and launches like a rocket ship. At about forty feet above the ground, you bring the machine back to level, and the wings generate lift. It's only then that the craft starts to look as though it wants to be in the air.

My first flight instructor was Charlie Bushby, a soft-spoken, bespectacled British pilot with a genteel accent and a collection of refined loafers. He had actually never flown a BlackFly—he slightly exceeded its size limitations. But, he told me, "over the fortnight you're with the customer, you take them on a very unique journey. It's a dream they've always had—to experience flight." The curriculum typically began with the very basics—the use of checklists and the like—but the training was supposed to be a "bespoke, white-glove customer experience," and Bushby wanted to get me into the simulated air as quickly as possible.

I assumed the pilot's chair, put on a virtual-reality headset, and gripped the joystick with carnival-booth force. (Bushby noted that aircraft generally respond better to gentle movements than to twitches of terror.) He set the simulator to begin in Central Park and led me through the ignition sequence. The chair pitched back abruptly as I lifted into a hover, then evened out. Bushby added in a nice tailwind and topped off my battery as I flew south through midtown, past the abandoned heliport of the old Pan Am Building, and then over the East River in the direction of my apartment, in Brooklyn. It was hard not to feel a sense of wonder, peering down over recognizable streets and buildings I'd never seen so closely from above.

Nobody is going to be flying himself home from Manhattan anytime soon. For one thing, we don't yet have the ground infrastructure; Thrun thinks that landing on rooftops, for example, would be a pain. "You would need the right roof and the right fencing, so kids don't fall off," he said. "To me, it sounds very expensive." Regulators would also laugh you out of the room. Operating a standard, nonexperimental aircraft in an urban environment already involves multiple layers of bureaucracy: from the F.A.A., which oversees airspace, and from municipalities, which oversee the ground. The municipal rules can be strict. Until recently, San Francisco prohibited nearly all helicopters from landing within the city limits. Uri Tzarnotzky, the lead designer at Wisk, one of the companies traceable to Page, told me, "The reality is that people really don't want everybody to have one of these. If you look at the comments section of the YouTube videos, there's

a mix of NIMBYism and 'Have you seen how people drive?'"

The BlackFly cannot be flown in controlled airspace—near an airport or above a certain altitude—or over congested areas, and it can't be employed in commercial activities. It can't even be flown in a strong wind or a light drizzle. Its batteries currently allow for a maximum flight time of about twenty-five minutes, but battery life is not something you want to mess with; power is required for a controlled descent. The company's newest model costs about two hundred thousand dollars. Karklin, Pivotal's C.E.O., said, of his customers, "If I'm going to generalize, they're white, over fifty, and male." Bushby projected that Pivotal's customer base would represent "places with some money and a lot of uncontrolled airspace." Miami was no good, but maybe Louisville.

"As a business case, don't underestimate recreation," Karklin said. "Polaris is a multi-billion-dollar company, and they sell snowmobiles." Some customers have actual use cases in mind. They might, for example, survey their vineyards. A customer in central California wants to commute a dozen miles, from his ranch to his manufacturing plant, and Pivotal's team had drawn up a courtesy flight plan that wouldn't endanger his neighbors. Other customers were more ambitious: "We've got a father-daughter superfan team that wanted to cross the country twenty minutes at a time." (The company talked them out of it.) Pivotal's first customer, Tim Lum, lives in Washington's North Cascades. One of his buddies lived on the next ridge over, a forty-minute walk or a two-minute flight. He told me, "My first few flights, the townspeople or the ranchers would call the sheriff." One day, he approached a neighbor who he heard was planning to shoot down what the neighbor thought was a surveillance drone: "My neighbor said, 'It's you, isn't it?' I said, 'Of course it is.'"

Karklin readily conceded that the BlackFly was, for the moment, a pleasure craft for the wealthy. But nobody would have looked at the Wright brothers' plane at Kitty Hawk and predicted that we'd have a Boeing 707 sixty years later; these new crafts could be just the beginning of a similar sea change in aviation. "Every transportation revolution going back to probably the chariot—who are the early adopters? People with resources. Who bought the first cars? People called them 'toys for rich people.'" Karklin continued, "Right now, we're Michael Douglas in 'Wall Street,' on the beach with that giant brick of a cell phone." Leng, for his part, believes that regulatory anxieties will ease as people grow habituated to personal flight, just as they did to commercial. Imagine a parallel universe, Leng suggested, where small airplanes were the norm: "Now you say, O.K., I want to build a plane for five hundred people, it's going to weigh a million pounds, on takeoff it's going to be carrying four hundred thousand pounds of highly flammable fuel, and we're going to fly it over our biggest cities!"

For now, Pivotal maintains a degree of gentle paternalism. Karklin told me that the company had been approached by a YouTube influencer wearing a skin-tight flight suit and had given her a "soft no," suggesting that perhaps a future model would better meet her needs. The company anonymously monitors all customer usage and is prepared to ground customers who damage the aircraft or get edgy with battery capacity.

My childlike delight persisted in the simulator until I encountered virtual-reality nausea, first gradual and then sudden.

HYACINTH

I think of him in his thinning white undershirt,
crisp white button-down, bluejeans,
and the red wool jacket that was a gift from my brother

who took my hand and placed it in my father's hand
before my father's hand was no longer my father's hand,
a hurried gesture, spontaneous, and full of my brother's kindness.

My brother was on watch. "Hurry," he'd said,
until he was surrounded by sisters.
We were all silent.

I don't know if my father forgave the years
I did not love him. Decades, even,
when I did not know I loved him.

Feels as if sorrow, like the highest shelves
at the dollar store I sometimes wander,
replenishes itself.

A month later, it was somehow April
in Washington State and a law was passed
that would have allowed us to place our father

in a vessel and surround him with wood chips
and straw, fungi and protozoa,
then let the compost age in an open-top

fifty-five-gallon drum until,
all seven brass-colored snaps
and two replaced hips sieved out,

he could have become soil for my mother's garden,
where the hyacinths, silent purveyors of sorrow
and forgiveness, might go forth and multiply.

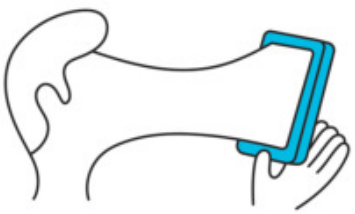
—Catherine Barnett

But there was no time to lie on the carpet. The BlackFly's flight controls are intuitive—like a relatively simple video game—but the stakes are high, and the cognitive load is considerable. Motor temperatures and battery levels must be monitored constantly, lest the vehicle experience what is politely referred to as "uncontrolled descent into terrain." As these thresholds near, the craft becomes agitated, with dinging alarms and colored alerts: yellow, or land soon; red, or land immediately; and purple, or pull the red knob to activate the whole-craft parachute. Nobody has ever pulled the red knob. The company's best guess is that it doesn't really help below about a hundred and sixty feet. My own flight was not supposed to exceed a hundred and ten. They nevertheless had to insure that I knew how to pull the red knob.

The BlackFly lands the same way it takes off, by tilting back nearly ninety degrees to induce drag, in the manner of a descending pigeon. This position makes it difficult for the pilot to see the ground below. In my attempt to set down gently in Prospect Park's Long Meadow, I smashed into a large tree. Bushby, apparently unperturbed, was optimistic: "Maybe one day you really could be flying this over New York." For the next three days, I arrived early to practice. I was drilled in how to recover from the loss of various instruments—G.P.S., altimeter—and what to do if a joystick failed. (The protocol for the loss of the right joystick is to trigger the left joystick; the protocol for the loss of both joysticks is to hope it never happens.) At the end of the final simulator day, I was tested by the chief flight instructor, an Army veteran named Rob Dreer, who flew drones in Afghanistan and Iraq. After three hours, Dreer cleared me for my first actual flight. He grew solemn, as if he were sending me into battle. He had seen photos of my children. "The true milestone of being a real pilot is being up there by yourself," he said. "You'll experience that tomorrow—being a true aviator." Then he set the simulator location to Yosemite, where I let my anxiety drain off in slow, serene loops between Half Dome and El Capitan.

Although advanced air mobility in America is heavily concentrated in Silicon Valley, the tacit industry motto seems to be "Move slowly and break nothing." There are a variety of more or less measured approaches to the aerial transit of the future, and a company called Beta Technologies has decided to focus first on cargo logistics and military applications, sectors in which eVTOL operations can be refined without the need to build additional infrastructure or to convince passengers to come on board. On a cold, overcast day in January, I met Beta's C.E.O., Kyle Clark, at the company's research-and-development facility, in a renovated hangar in South Burlington, Vermont. Clark is tall, restless, and rangy—a "lanky-ass bastard," he called himself—with a tattooed band on his ring finger. The F.A.A. requires that planes accommodate all passenger sizes from the fifth percentile of women to the ninety-fifth percentile of men, but Beta had to extend the latter to the ninety-ninth percentile for Clark. "Right now, we operate in this two-dimensional world," Clark told me. "Even a commercial flight going three thousand miles at thirty-two thousand feet, that's horizontal, for all intents and purposes. And we're going to go ahead and *add* a whole other dimension to where you can be and go? The whole thing—how can it not be really intriguing?"

When Clark was a kid, all he wanted to do was fly. Every birthday and Christmas, he requested an airplane. His parents were unusually permissive, but, when an adolescent Clark started building an ultralight in his garage, his mother set the parts on fire. She drew the line



at D.I.Y. aviation. As a junior at Harvard, in 2001, Clark left to play hockey for the Washington Capitals. He spent his signing bonus on flight training. When he returned to college, a few years later, he won the engineering department's prize for his thesis, a plan for an aircraft that a pilot could guide with body pressure; ultimately, he envisioned a flying motorcycle that you could drive out of the airport. When he sold his first company, which made power electronics, he bought a Cessna and a partially assembled kit aircraft, which he completed himself.

In 2017, Martine Rothblatt, the founder of a biotechnology company, told Clark that she needed an environmentally friendly, cost-efficient way to move organs between medical facilities. He rushed over to the Burlington airport and arranged to rent an office. Not long after, the airport leased him a derelict hangar where snow-removal equipment was being stored. His team, then made up of eight people, had to invent and manufacture its own parts. Such is the force of Clark's personality that he and his team finished an eVTOL prototype in ten months. In an initial funding round, the company raised three hundred and sixty-eight million dollars. "Every day, I say that there are two things that'll put us out of business—running out of money and killing people in our planes," Clark said. "And we're doing everything we can to insure that won't happen." Beta now has more than six hundred employees, most of whom seem to have wandered in from a dog park outside a microbrewery. One of the company's pilots, who flew me in the chase plane that accompanies their aircraft for observation, was previously a local pizza-delivery guy who moonlighted as a flight instructor. From the beginning, Clark wanted his engineers to know how to fly—"It's different to design landing gear when you're the one flying the plane"—so he hired a retired fighter pilot as an in-house teacher. The decision was canny, morale-wise. "When people get the bug and love flying, their passion drives them harder than any perks or bonuses," he said. One employee told me that, in his first interview, Clark taught him how to fly a helicopter.

The drive from South Burlington to Beta's facilities in Plattsburgh, New York, is about an hour and a half and includes a ferry ride. It's also a twelve-minute flight. It was what Clark unironically described as a "beautiful day" in January—freezing temperatures under a gunmetal sky. We climbed into the company's 1967 Cessna, and, as we ascended, I withdrew my phone to record the patterns of fractured ice on Lake Champlain below. "See? If we were in a car, I bet you wouldn't be taking pictures," he

said. The airstrip on the far shore stretched out before us, and Clark came in for a low, slow descent. As he touched down, he made sure that I registered his relaxed achievement: "That was a no-flap landing, by the way."

Clark's team was busying itself in a whitewashed Cold War-era hangar. Its eVTOL, called Alia, is vaguely based on the skeleton of an Arctic tern, with a fishbowl cockpit. To me, it looked immaculate, but Clark said, "Could've cleaned the fucking bugs off the windscreen." UPS had already ordered as many as a hundred and fifty of the vehicles, which it planned to use for its "middle mile" routes, between distribution centers and warehouses. Other potential customers showed an immediate interest in a conventional-takeoff version, which in any case was going to be easier to certify, so the team built a near-identical second model without lift propellers. Clark's pitch was not only about sustainability. Electric motors run at much lower temperatures and show less performance wear. Electric aircraft are orders of magnitude cheaper to fly, and they will improve over time as higher-capacity batteries are swapped in. Like helicopters, they can also land pretty much anywhere, but at a fraction of the cost and with less of a din. Certain drones are already being used to transport blood and medical supplies in parts of sub-Saharan Africa where there are few roads, but you can't put a doctor, or hundreds of pounds of medical equipment, in them.

Clark told me that he also recently signed a contract with the U.S. Air Force, worth up to a hundred million dollars. Electric vehicles could make forward operations less reliant on fuel supply lines. The Pentagon recently spent more than ten billion dollars in a year on fuel alone. A study found that more than half of the American casualties in Iraq and Afghanistan were in fuel or water convoys, not actual battles. One National Guard officer sketched for me a vision of a decentralized Pacific theatre in which electric vehicles could "refuel" with solar panels on remote islands. Vertical takeoff and landing could be used for the transfer of supplies to far-flung places without airstrips. The military recently tested Beta's craft in a simulated casualty evacuation and found that sixteen hundred dollars of fuel could be replaced by five dollars of electricity.

Back in the Cessna, Clark turned to me and said, "You take the controls now." I put my feet on the pedals and practiced some rudder movements as we turned onto the runway, where he instructed me to throttle up a bit. As we reached takeoff speed, he coached me to lift the nose, and I could feel the wings bite into the air. He directed me into a banking right, but in my exhilaration I may have pushed our angle of attack into dangerous territory. "Um, maybe nose down a little before we stall there," he said. He asked if I wanted to fly the rest of the way back, and land, but I happily gave up the controls. He still thought we all deserved to experience personal flight, but he acknowledged the scale of the challenge. When he first raised money for the company, he told me, "there was all this social pressure to do the obvious thing—to hop over traffic—and we thought about doing that, but we're pragmatists about the way to get there." He added, "We do believe we'll get to urban air mobility." As we crossed back over the small bays where he used to play hockey, he peered down to examine them. "If it were late February, I'd offer to land on the ice." He smiled as he thought it over. "Well, it's *probably* safe if we needed to," he said. "But I guess we don't."

The world wasn't quite ready for Larry Page's original vision of a personal craft that could land in a parking space, but his efforts ultimately coalesced in the form of a company called Wisk, now a subsidiary of Boeing. Wisk, along with its rivals Joby and Archer, settled on an air-taxi model. Wisk's design employs rotors that operate vertically for lift and then tilt horizontally for thrust. (This is the architecture used by the Bell Boeing V-22 Osprey, which was recently cleared to fly again after being grounded in the wake of several fatal crashes.) The company's current craft, called Cora, has an average speed of about a hundred and forty miles an hour and a range of about a hundred miles. The company's design shop is in the Bay Area, in a cul-de-sac behind Pivotal. When I visited, last year, Wisk employees showed me a prototype of their newest model, which seated four passengers. With a bulky fuselage painted a blinding shade of yellow, the vehicle looked like a miniature school bus. Tzarnotzky, the Wisk designer—a large, thoughtful man with the aspect of a plush bear—told me, "Our competitors have a dark, exclusive branding that's supposed to communicate a jet-set life style. People have criticized this for looking like a minivan with wings—but that's a good thing! You want Grandma in the minivan, not in the thrill ride."

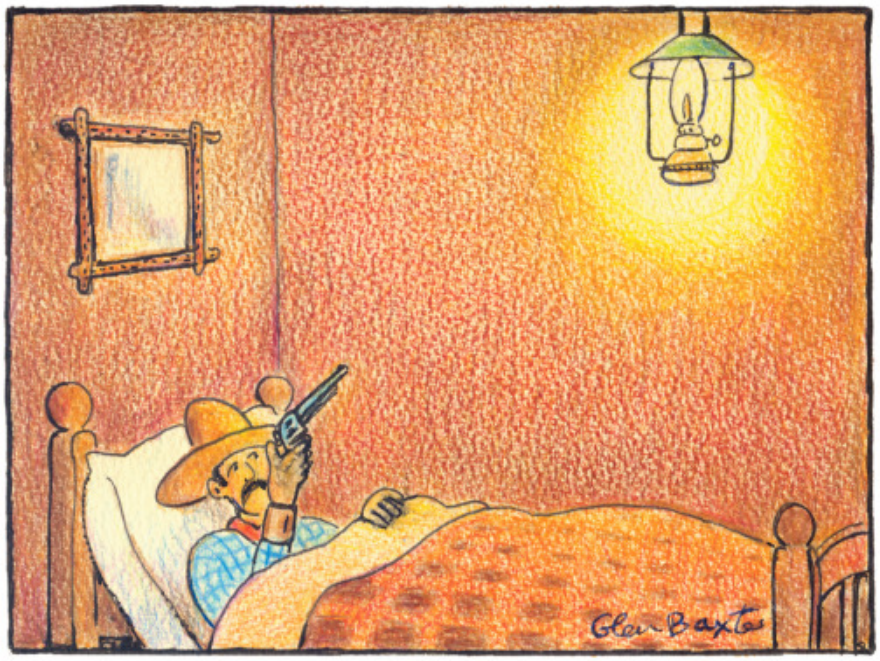
The air-taxi idea goes like this: you book your trip through an app; you stroll a few blocks to the closest vertiport (an existing helipad for now, while municipalities or contractors construct new infrastructure); you stow your bag in the "frunk," climb in, and fasten your seat belt tight across your lap; the taxi ascends in a hover, transitions to forward flight, and joins a zippy procession of other craft along an established aerial corridor, probably one that follows a highway below. They will almost certainly be used first for transit to airports or for local tourism—to reach offshore islands, say. If this sounds like the democratization of the helicopter, it is. "There's a reason a lot of this is focussed on Los Angeles," David King, a professor at Arizona State University who studies transportation, told me. "The reason Kobe Bryant flew around in helicopters was because he was rich, but the other reason a fairly high share of rich people in L.A. are already getting around by helicopter is because up until a decade ago all skyscrapers there had to be flat on top, for helipads."

What differentiates Wisk from its competitors is the absence of a pilot. More than half of the company's team flies their own planes; on sunny Saturdays, they have a club that meets for what hobbyist pilots like to call a "hundred-dollar burger." But Wisk's business-model calculations suggested that pilots do not pencil out—they add weight, require training, and typically insist on a salary. Also, there aren't nearly enough of them, and a discount pilot is much worse than no pilot at all. Planes already do about ninety per cent of the flying themselves. Even if most commercial passengers are aware, on an intellectual level, that the skilled but underutilized pilots in the cockpit are mostly being paid to drink coffee, the idea of fully autonomous flight will require some acculturation. When I took a seat in a full-scale mockup of Wisk's prototype, a soothing video

displayed my proposed flight path. A supervisor on the ground oversees the flight and can intervene if necessary. The display consoled me with the prospect of communicating with a "remote hospitality crew."

In the long run, these companies imagine a world of aerial commuters. According to a Deloitte report, air-taxi services would be three to five times faster than existing ground transit. Over time, we might free up resources dedicated to decaying roads and bridges in favor of streams of evenly spaced aircraft proceeding overhead. Despite the metropolitan "Blade Runner" allure of this vision, Cyrus Sigari, the prominent investor, told me, "The suburban and rural use cases are way more relevant and easier to address" than flying taxis within cities. In theory, it would be possible to live in Scranton or Binghamton and make it to New York City in half an hour. David King, the Arizona State professor, noted, "Air-taxi routes could help rejuvenate some rural economies, if the cost was such that you could legitimately live ninety to a hundred miles away from your work." Matthew Clarke, the engineering postdoc, told me that, as someone from a minority background, he tends to be skeptical of shiny technocratic solutions, but he sees something real here. "I've talked to janitors from Stockton, people who spend a lot of money on gas every day to commute for hours, who could take a short flight from Stockton Airport to Palo Alto Airport. Instead of waking up at 4 A.M., they could wake up at 7 A.M." (Alternatively, the Bay Area could build more housing.)

Wisk has a tentative agreement with the Council of Mayors of South East Queensland, Australia, which is hoping to offer Wisk services to tourists and locals in time for the Brisbane Olympics, in 2032. My visit to Wisk coincided with the arrival of a delegation of Australian officials, who had come to watch a test flight at a rural airport. Adrian Schrinner, the ruddy, thick-necked Lord Mayor of Brisbane, swept his hand over his brilliantined hair and told me that he'd volunteer to take the first passenger flight. (His P.R. person leaned over and said, in a stage whisper, "The Deputy Lord Mayor is quite O.K. with that!") We stood in a light rain at the end of the runway and watched Cora take off in a sibilant hover. At about a hundred feet, the aircraft shifted to horizontal flight.



FOR THE HOTEL MANAGERS OF OLD EL PASO, THE INVENTION OF THE DIMMER SWITCH COULD NOT COME A MOMENT TOO SOON

• •

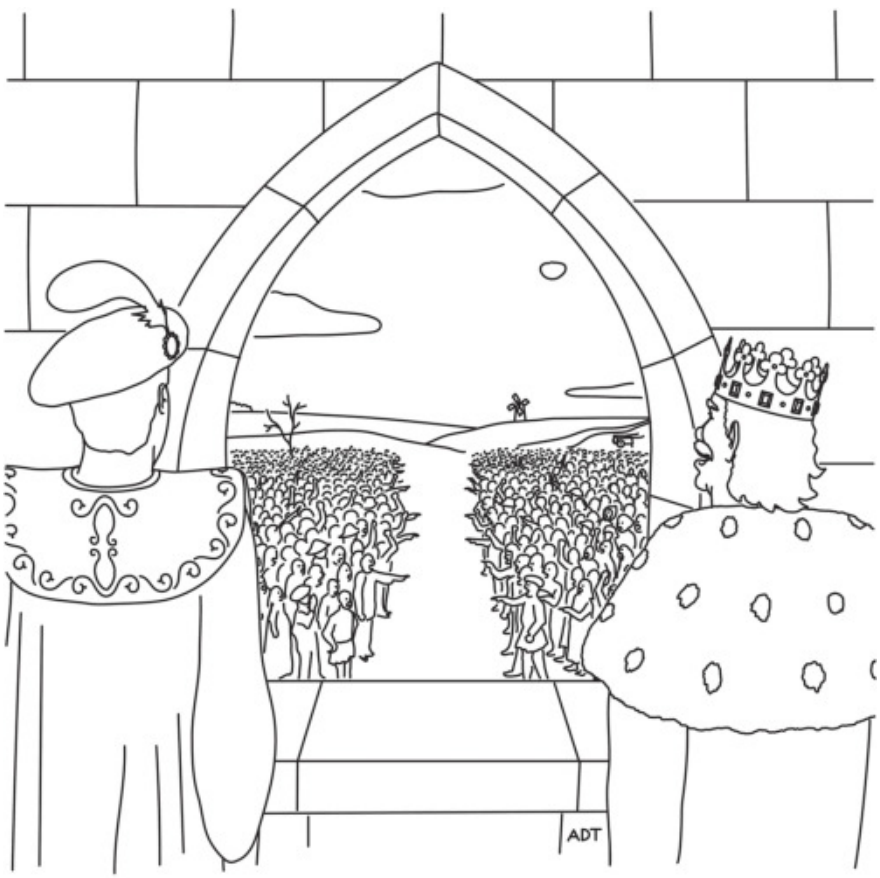
The moment of transition drew muted awe, but once in flight it just looked like a little airplane—although a passenger alone inside would presumably have felt otherwise. By the end of the demo, most of the mayors were glancing down at their phones, trying to figure out if the videos they took were impressive. Jim Tighe, Wisk's C.T.O., told me that he hopes to see this sort of behavior among customers in the air, too: "When people get out their phones and doomscroll during a flight, I think, I really nailed it!"

At Wisk's offices, Schrinner told me that air taxis could one day connect remote Indigenous communities to urban hospitals, or sightseers to the Bay Islands. "It's only eighty kilometres from Brisbane to the Gold Coast," he said. "It should only take an hour by car, but on a busy weekend it can take two." Out of curiosity, I asked how long public transit takes. He paused before admitting that he didn't know. But in a Wisk it might take as little as fifteen minutes. He picked up a toy model of Cora and said, "At back-yard barbecues, people tell me, 'This is far-fetched, we've heard about flying cars for decades.' But we saw it this morning, and it's not a pie in the sky. I tell them, 'It will happen.'"

People in the industry tend to think that flight is useful and awesome, and not necessarily in that order. One of the reasons that the idea of flying cars has endured is that it seems to promise two different kinds of freedom: on the one hand, to get from point A to point B without a lot of hassle; on the other hand, to know the euphoria of exploring the third dimension. Most people at these companies got into the business because they were personally enraptured by flight. They are nonetheless well aware that airplanes and automobiles have vastly different requirements, and that the vision of a car that both drives and flies never made a ton of sense. An inventor and professor named Paul Moller spent four decades working on his Skycar, believing for years that it was just within reach. In 2009, as the modern industry was starting, he went bankrupt. For a period, a company called ASKA had a mockup of

a flying car in a window display in downtown Los Altos, California; members of its "Founders Club," who paid a five-thousand-dollar deposit to get on the preorder list for an eight-hundred-thousand-dollar vehicle, were entitled to customize their aircraft's design. Today, the storefront is vacant. (The company says it's looking for a bigger showroom.) Soberer parties now understand that you have to make trade-offs between the breathtaking and the handy. During one of my visits to Wisk, I was inadvertently shown a set of talking points that employees had been given. Their comments were to be restricted to observations "grounded in reality/today," and they were instructed to "avoid making bold claims that cannot be backed up with data/proof." Beta was even reluctant to be portrayed as building anything like a flying car.

One company already has a deal with United to start air-taxi services to Newark Airport next year, but such deals remain highly provisional: a German startup planned to fly passengers at this summer's Paris Olympics, until European regulators quashed the idea. Dubai seems poised to begin offering services; China's regulatory body just approved the mass production of an eVTOL for commercial use. But for such plans to become a widespread reality, let alone the future of transport, regulatory agencies will have to be coaxed into an overhaul of the way that airspace is structured and administered. We would need foolproof, digital detect-and-avoid systems to prevent collisions. eVTOLs might not be helicopter loud, but they are noisy. Engineers think that this issue can eventually be ameliorated, but, if it can't, no one will be happy with an insistent mosquito buzz in the background. And then there's the sheer number that would be needed. Before the pandemic, about four hundred thousand people a day crossed the Hudson River into Manhattan. Aerial commuting would require tens of thousands of drone taxis operating on regular, reliable schedules, with flawless safety records. David King told me, "So all of a sudden you're into the realm of, 'Why didn't we just build a train?'"



"A revolutionary war was brewing, but I managed to turn it into a culture war."

Most responsible urban planners believe that public transit is a political problem, not a technological one. The tools to improve urban mobility—trains, trams, bicycles, sidewalks—have been around for a long time. The issue isn't that we were promised flying cars and got a hundred and forty characters; it's our attachment to a nostalgic kind of gizmo-first futurism, one that speaks to a profound failure of the national imagination. There's something a little dismal about the fact that the mid-century dream of the future might, if everything goes perfectly according to plan, come to fruition in the form of saving half an hour en route to J.F.K. Then again, that isn't too far from the initial vision. In an age of abundance, the promise of the future sold to affluent suburbanites was one of ever-greater consumer ease. George Jetson was not dizzyingly free; he had a flying car that folded up into a briefcase, and he used it *to get to work quickly*.

Almost everyone in the industry thinks that personal aerial vehicles will arrive eventually—maybe in twenty years, maybe in fifty. If they do, it will be through a series of gradual changes—the kind of thing that can look, to the untrained eye, like stagnation. Peter Thiel and J. Storrs Hall seem to find it almost personally insulting that jets look just like they did in the sixties. But Brian Yutko, a former Boeing executive who is now Wisk's C.E.O., told me, "That's so off base. Do the airplanes largely look the same if you're a four-year-old holding up two pictures? Yes, but they're actually pretty different. They got seventy per cent more fuel-efficient, they have a much longer range, and safety incidents have been driven as close to zero as possible." He continued, "That's technological progress that took human ingenuity for five or six decades. Other sectors should learn from that! It's not stagnation, it's 'How did you do that?'"

Last fall, I joined Wisk's team in New Zealand, where it was participating in an "airspace integration test"—a pioneering attempt to introduce unmanned flights into an area with commercial planes and other air traffic. New Zealand has a lot of empty sky, crashes pose a risk largely to sheep, and the country's regulatory agencies have been hospitable to experimentation. The tests took place about twenty miles south of Christchurch, on a thin, dusty isthmus called

the Kaitorete Spit. The airfield there is a joint venture with local Maori councils, who named it Tāwhaki, for a god who gathered knowledge from the heavens and brought it back to earth.

One design for early automobiles, known as Horsey Horseless, featured an artificial horse head mounted on the front of the chassis, so that it would resemble something familiar to other horses on the road. Wisk took a similar approach in the test. It was using a Boeing drone that was not being flown autonomously but by pilots in regular communication with air-traffic control; the pilots simply happened to be on the ground rather than in the cockpit. This was quite a big step for commercial aviation, in which virtually all procedures are based around the presence of an onboard pilot, but the accomplishment was buried under a barrage of bureaucratic acronyms: they hoped to do B.V.L.O.S. for an R.P.A. under I.F.R. conditions in C.T.A. One employee, who had come to Wisk from a jet-pack startup, told me that "a scaled-up U.A.M. operation would saturate the existing system within minutes." U.A.M. means "urban air mobility," and what they were doing here, he continued, was laying the groundwork for a P.S.U.

"What's a P.S.U.?" I asked.

"A provider of services for U.A.M.," he said, laughing. "It's an acronym within an acronym."

The pilots, dressed in vintage patterned fleeces and heavy work boots, were camped in the rear of a ground-control trailer. They were confident that their vehicle's path would be even more precise and reliable than that of a standard craft. It was launched with the faint snow cover of the Southern Alps in the distance, and it climbed in a tight spiral to twenty-five hundred feet before the pilots requested clearance to enter controlled airspace. The reply came over the radio: "You are identified and cleared." To a civilian, it wasn't easy to tell what the fuss was all about. Aviators, however, knew better. Boeing's regional executive, who had come to make a bottle-breaking appearance, declared it an "enormous milestone for aviation."

Byron Airport is an uncontrolled airfield about forty miles east of the Bay Area. On the morning that I arrived, the winds were calm, at about three knots from the east, with scattered cloud cover at thirteen thousand feet. Mt. Diablo was visible in the haze, and the windmilled hillsides, freshened by a week of rain, were a deep green. Wyatt Warner, Pivotal's chief test engineer, hauled a BlackFly on a trailer to a small landing pad, which made a sucking sound in the mud. We waited for a plane-load of skydivers, who bloomed against the gray cloud cover, to finish their descent. Then Warner took off in the BlackFly for a nine-minute test flight. His flight was elegant, though the craft still looked as if it didn't want to be in the air—like a tractor having a nightmare. Allison King, a mechanical engineer who was monitoring flight data, told me that she'd come across Pivotal's Web site shortly after graduating from M.I.T. "I thought, Well, that's just C.G.I.," she said. "Then I looked at the disclaimer that said, 'This is not C.G.I.,' and I was, like, 'Wait, what?' "

When Warner returned, Charlie Bushby, my first flight instructor, said, "You know what that means?" They gave me a flight suit with a smart BlackFly patch. Warner, watching the jumpers, was reminded of an old joke: "The good thing about when your parachute doesn't open is that you have the rest of your life to solve the problem." Idle conversation turned to plane-crash survival: a Serbian flight attendant who fell from thirty-three thousand feet and lived; those who walked away from the 1999 crash in Sioux City. We spoke about a local test pilot who had worked for Beta and interviewed at Pivotal; he had died weeks before in a tragic kit-plane crash. Bushby said, "Perhaps let's not talk about this right now?"

With a clipboard checklist strapped to my thigh, I climbed up into the vehicle and slid the plexiglass canopy over my head. I turned the propellers on, tested the controls, and then initiated the takeoff sequence. My first flight was a simple hover—up and then down. The propellers began to spin with the sound of leaf blowers, the craft reared back, and I was wrenched upward, pinned to my seat, heart hammering. Warner had instructed me to breathe, but my body sent only lurching reminders that flight is wrong. I hung there just long enough to steal a hurried glance in each direction, then thumbed the toggle to descend. In what felt like both an instant and an eternity, I was back on the ground. We let the craft rest for ten minutes before my second test flight, which involved flying in a small box pattern over the landing pad. The flight plan meant a long interval in pure hover, and while I was airborne my motor temperatures quickly hit a hundred and twenty degrees. The yellow warning lights flashed; although I wasn't perfectly centered over the pad, this seemed like a good time to land, which I did, with a little skid into the mud. I hopped out, and Warner and I dragged the BlackFly back to the proper takeoff spot.

I was now ready, they told me, to fly for real. As I took off into a hover, I twisted the stick to the right, turning away from everyone below, and lit out in the direction of the hills. Once I levelled off, the propellers quieted to a much softer hum, and all at once I had a feeling of lightness and agility in the air. Below me were muddy ponds, glistening patterns of water and grass, a cluster of black cows. I crested through a long, slow turn over the base of the foothills, and the machine felt alive to my touch. The company had disabled cruise mode, limiting me to an airspeed of about thirty miles an hour—something they said they'd done to prevent me from accidentally slipping into higher gear. But I knew now that, if cruise weren't disabled, I would have pushed the craft to whatever speed was available to me; I would have flown in the direction of the hills and the sky and never come back; I would be up there still. There was the sense that the vibrating craft was an extension of my limbs. It was no wonder that the disembodied march of software had left so many technologists longing for the experience of living inside the circuitry. Entirely forgotten was the banality of commuting to work. The delirium of flight was enough. I glanced at my viewscreen, began the slow, gradual descent I'd practiced on the simulators, and, with great reluctance, triggered the sequence to land. ♦

ONWARD AND UPWARD WITH TECHNOLOGY

GET REAL

How video-game engines became the invisible infrastructure of our world.

BY ANNA WIENER

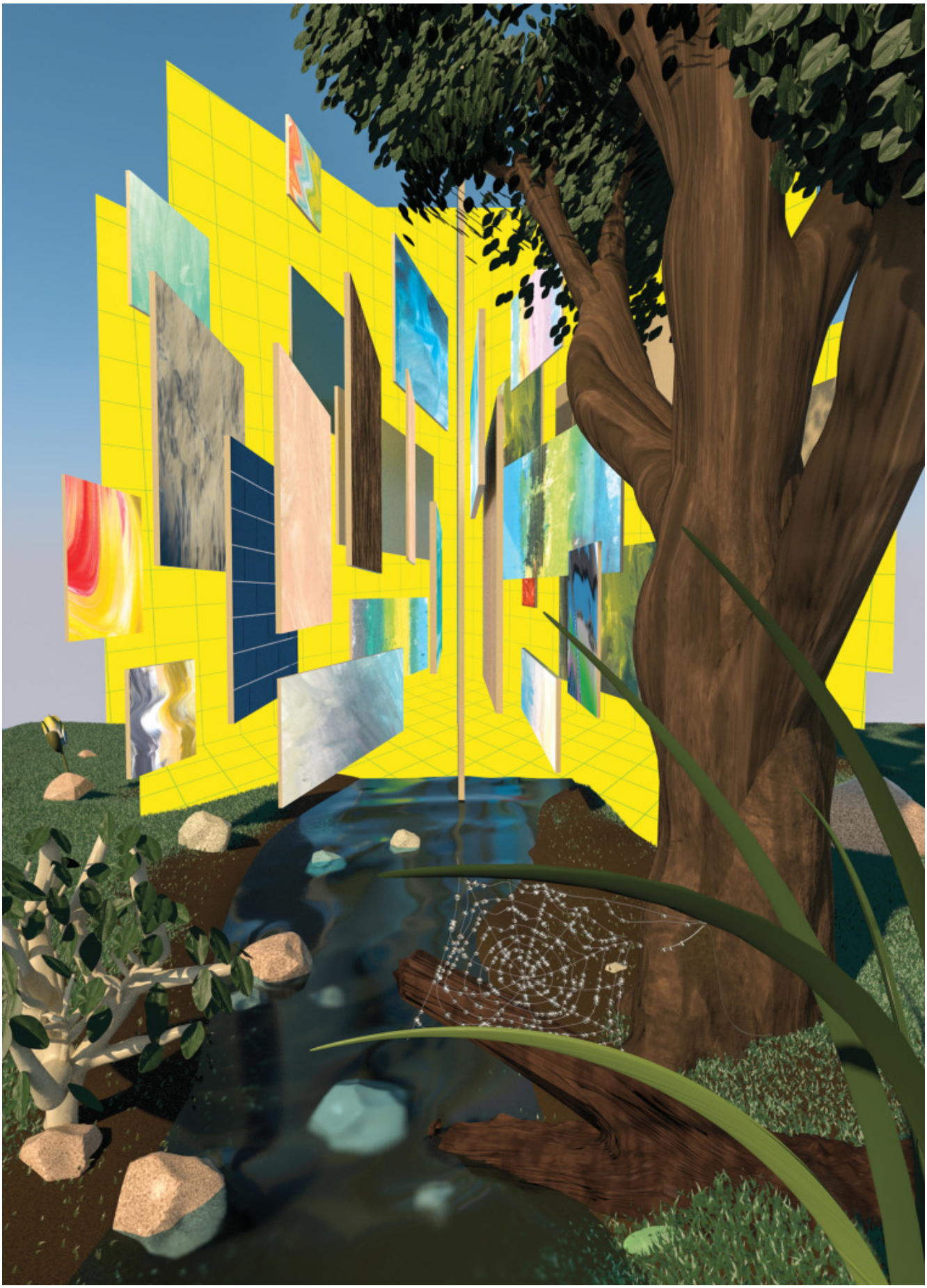
On a warm afternoon last fall, Steven Caron, a technical artist at the video-game company Quixel, stood at the edge of a redwood grove in the Oakland Hills. "Cross your eyes, kind of blur your eyes, and get a sense for what's here," he instructed. There was a circle of trees, some logs, and a wooden fence; two tepee-like structures, made of sticks, slumped invitingly. Quixel creates and sells digital assets—the objects, textures, and landscapes that compose the scenery and sensuous elements of video games, movies, and TV shows. It has the immodest mission to "scan the world." In the past few years, Caron and his co-workers have travelled widely, creating something like a digital archive of natural and built environments as they exist in the early twenty-first century: ice cliffs in Sweden; sandstone boulders from the shrublands of Pakistan; wooden temple doors in Japan; ceiling trim from the Bożków Palace, in Poland. That afternoon, he just wanted to scan a redwood tree. The ideal assets are iconic, but not distinctive: in theory, any one of them can be repeated, like a rubber stamp, such that a single redwood could compose an entire forest. "Think about more generic trees," he said, looking around. We squinted the grove into lower resolution.

Quixel is a subsidiary of the behemoth Epic Games, which is perhaps best known for its blockbuster multiplayer game Fortnite. But another of Epic's core products is its "game engine"—the software framework used to make games—called Unreal Engine. Video games have long bent toward realism, and in the past thirty years engines have become more sophisticated: they can now render near-photorealistic graphics and mimic real-world physics. Animals move a lot like animals, clouds cast shadows, and snow falls more or less to expectations. Sound bounces, and moves more slowly than light. Most game developers rely on third-party engines like Unreal and its competitors, including Unity. Increasingly, they are also used to build other types of imaginary worlds, becoming a kind of invisible infrastructure. Recent movies like "Barbie," "The Batman," "Top Gun: Maverick," and "The Fabelmans" all used Unreal Engine to create virtual sets. In 2022, Epic gave the Sesame Workshop a grant to scan the sets for "Sesame Street." Architects now make models of buildings in Unreal. NASA uses it to visualize the terrain of the moon. Some Amazon warehouse workers are trained in part in gamelike simulations; most virtual-reality applications rely on engines. "It's really coming of age now," Tim Sweeney, the founder and C.E.O. of Epic Games, told me. "These little 'game engines,' as we called them at the time, are becoming simulation engines for reality."

Quixel got its start helping artists create the textures for digital models, a practice that historically relied on sleight of hand. (Online, a small subculture has formed around "texture archaeology": for Super Mario 64, released in 1996, reflective surfaces would have been too inefficient to render, so a metal hat worn by Mario was made with a low-resolution fish-eye photograph of flowers against a blue sky, which created an illusion of shininess.) It soon became clear that the best graphics would be created with high-resolution photographs. In 2011, Quixel began capturing 3-D images of real-world objects and landscapes—what the company calls "megascans." "We have, to a great extent, mastered our ability to digitize the real world," Teddy Bergsman Lind, who co-founded Quixel, said. He particularly enjoyed digitizing Iceland. "Vast volcanic landscapes, completely barren, desolate, alienlike, shifting from pitch-black volcanic rock to the most vivid reds I've ever seen in an environment to completely moss-covered areas to glaciers," he said. "There's just so much to scan."

Digitizing the real world involves the tedium of real-world processes. Three-dimensional models are created using lidar and photogrammetry, a technique in which hundreds or thousands of photographs of a single object are stitched together to produce a digital reproduction. In the redwood grove, as Caron set up his equipment, he told me that he had spent the past weekend inside, under, and atop a large "debris box"—crucially, not a branded Dumpster, which might not pass legal review—scanning it from all angles. The process required some nine thousand photographs. ("I had to do it fast," he said. "People illegally dump their stuff.") Plants and leaves, which are fragile, wavery, and have a short shelf life, require a dedicated vegetation scanner. Larger elements, like cliff faces, are scanned with drones. Reflective objects, such as swords, demand lasers. Lind told me that he loved looking at textures up close. "When you scan it, a metal is actually pitch-black," he said. "It holds no color information whatsoever. It becomes this beautiful canvas." But most of Quixel's assets are created on treks that require permits and months of planning, by technical artists rucking wearable hard drives, cameras, cables, and other scanning equipment. Caron had travelled twice to the I'on Swamp, a former rice paddy on the outskirts of Charleston, South Carolina, to scan cypress-tree knees—spiky, woody growths that rise out of the water like stalagmites. "They look creepy," he said. "If you want to make a spooky swamp environment, you need cypress knees."

The company now maintains an enormous online marketplace, where digital artists can share and download scans of props and other environmental elements: a banana, a knobkerrie, a cluster of sea thrift, Thai coral, a smattering of horse



The C.E.O. of Epic said that, in our lifetimes, computers will make images that are "completely indistinguishable from reality."

ILLUSTRATION BY JON HAN

manure. A curated collection of these elements labelled "Abattoir" includes a handful of rusty and sullied cabinets, chains, and crates, as well as twenty-seven different bloodstains (puddle, archipelago, "high velocity splatter"). "Medieval Banquet" offers, among other sundries, an aggressively roasted turnip, a rack of lamb ribs, wooden cups, and several pork pies in various sizes and stages of consumption. The scans are detailed enough that when I examined a roasted piglet—skin leathered with heat and torn at the elbow—it made me feel gut-level nausea.

Assets are incorporated into video games, architectural renderings, TV shows, and movies. Quixel's scans make up the lush, dappled backgrounds of the live-action version of "The Jungle Book," from 2016; recently, watching the series "The Mandalorian," Caron spotted a rock formation that he had scanned in Moab. Distinctive assets run the risk of being too conspicuous: one Quixel scan of a denuded tree has become something of a meme, with gamers tweeting every time it appears in a new game. In Oakland, Caron considered scanning a wooden fence, but ruled out a section with graffiti ("DAN"), deeming it too unique.

After a while, he zeroed in on a qualified redwood. Working in visual effects had given him a persnickety lens on the world. "You're just trained to look at things differently," he said. "You can't help but look at clouds when you've done twenty cloudscapes. You're hunting for the perfect cloud." He crouched down to inspect the ground cover beneath the tree and dusted a branch of needles—distractingly green—out of the way. Caron's colleagues sometimes trim grass, or snap a branch off a tree, in pursuit of an uncluttered image. But Caron, who is in his late thirties and grew up exploring the woods of South Carolina, prefers a leave-no-trace approach. He hoisted one of the scanning rigs onto his back, clipped in a hip belt to steady it, and picked up a large digital camera. After making a series of tweaks—color calibration, scale, shooting distance—he began to slowly circle the redwood, camera snapping like a metronome. An hour passed, and the light began to change, suboptimally. On the drive home, I considered the astonishing amount of labor involved in creating set pieces meant to go unnoticed. Who had baked the pork pies?

Sweeney, Epic's C.E.O., has the backstory of tech-founder lore—college dropout, headquarters in his parents' basement, posture-ruining work ethic—and the stage presence of a spelling-bee contestant who's dissociating. He is fifty-three years old, and deeply private. He wears seventies-style aviator eyeglasses, and dresses in corporate-branded apparel, like an intern. He is mild and soft-spoken, uses the word "awesome" a lot, and tweets in a way that suggests either the absence of a communications strategist or a profound understanding of his audience. ("Elon Musk is going to Mars and here I am debugging race conditions in single-threaded JavaScript code.") He likes fast cars and Bojangles chicken. Last year, he successfully sued Google for violating antitrust laws. Epic, which is privately held, is currently valued at more than twenty-two billion dollars; Sweeney reportedly is the controlling shareholder.

When we spoke, earlier this spring, he was at home, in Raleigh, North Carolina, wearing an Unreal Engine T-shirt and drinking a soda from Popeyes. Behind him were two high-end Yamaha keyboards. We were on video chat, and the lighting in the room was terrible. During our conversation, he vibrated gently, as if shaking his leg; I wondered if it was the soda. "It's probably going to be in our lifetime that computers are going to be able to make images in real time that are completely indistinguishable from reality," Sweeney told me. The topic had been much discussed in the industry, during the company's early days. "That was foreseeable at the time," he said. "And it's really only starting to happen now."

Sweeney grew up in Potomac, Maryland, and began writing little computer games when he was nine. After high school, he enrolled at the University of Maryland and studied mechanical engineering. He stayed in the dorms but spent some weekends at his parents' house, where his computer lived. In 1991, he created ZZT, a text-based adventure game. Players could create their own puzzles and pay for add-ons, which Sweeney shipped to them on floppy disks. It was a sleeper hit. By then, he had started a company called Potomac Computer Systems. (It took its name from a consulting business he had wanted to start, for which he had already purchased stationery.) It operated out of his parents' house. His father, a cartographer for the Department of Defense, ran its finances. Sweeney renamed

the company Epic MegaGames—more imposing, to his ear—and hired a small team, including the game designer Cliff Bleszinski, who was still a teen-ager. "In many ways, Tim Sweeney was a father figure to me," Bleszinski told me. "He showed me the way."

Sweeney's lodestar was a company called id Software. In 1993, id released Doom, a first-person shooter about a husky space marine battling demons on the moons of Mars and in Hell. Doom was gory, detailed, and, crucially, fast: its developers had drawn on military research, among other things. But id also took the unusual step of releasing what it called Doom's "engine"—the foundational code that made the game work. Previously, games had to be built from scratch, and companies kept their code proprietary: even knowing how to make a character crouch or jump gave them an edge. Online, Doom "mods" proliferated, and game studios built new games atop Doom's architecture. Structurally, they weren't a huge departure. Heretic was a fantastical first-person shooter about fighting the undead; Strife was a fantastical first-person shooter about fighting robots. But they were proofs of concept for a new method and philosophy of game-making. As Henry Lowood, a video-game historian at Stanford, told me, "The idea of the game engine was 'We're just producing the technology. Have at it.'"

Sweeney thought that he could do better. He soon began building his own first-person shooter, which he named Unreal. He recalled looking through art reference books and photographs to better understand shadows and light. When you spend hours thinking about computer graphics, he told me, the subject "tends to be unavoidable in your life. You're walking through a dark scene outdoors at night, and it's rainy, and you're seeing the street light bounce off of the road, and you're seeing all these beautiful fringes of color, and you realize, Oh, I should be able to render this." Unreal looked impressive. Water was transparent, and flames flickered seemingly at random. After screenshots of the game were published, before its release, developers began contacting Sweeney, asking to use his engine for their own games.

In 1999, the company moved to North Carolina. Soon, Unreal Engine was being used in a Harry Potter PC game and in America's Army, a multiplayer game created by the U.S. military as a recruitment tool. "The plan was to license the engine to anyone and everyone," Bleszinski later wrote in a memoir. "It would provide Epic with unlimited new revenue streams . . . *Ka-ching!*" Over time, the company improved rendering times and lighting capabilities. Characters cast shadows. A new system for creating waterfalls allowed for droplets of mist to leap from a fall's base. Bubbles, once popped, didn't disappear but exploded into little fragments. (The same principles applied in collisions between characters and weapons—instead of disappearing, fatally wounded characters collapsed or shattered—and gore became gorier.)

For game developers, polygons are a major preoccupation. These shapes, usually triangles, are the building blocks of almost all 3-D graphics. The more polygons a rendering has, the more detailed it is. Updates to the engine made it possible to include textures and characters with exponentially more polygons. "It's quite an incredible feeling to realize, I might be the only person on earth who understands that this is possible," Sweeney said of the breakthroughs. "And I'm looking at it right now on my computer screen, working. And in a few years everybody's going to know this, and have it. It will eventually be taught in textbooks." Today, Unreal Engine's user interface looks a little like a piece of photo- or video-editing software; it offers templates such as "third-person shooter" and "sidescroller."

Last year, at the annual Game Developers Conference, in San Francisco, Epic gave a presentation on new updates to Unreal Engine. Sweeney delivered opening remarks, wearing a black Ralph Lauren x Fortnite hoodie. Then executives showed off the engine's new capabilities—including near-photorealistic foliage and updated fluid simulations—using an interactive scene of an electric truck off-roading through a verdant forest. Birds chirped as the vehicle rumbled through a ravine, its engine emitting a thin whine. The tires bounced in accordance with the truck's suspension system. Leaves, brushed away, snapped back. Rocks were shunted to the side. People clapped at waving foliage. As the truck navigated through a puddle, water gushed over the tires. The man sitting next to me gasped.

Epic's demos are so system-intensive that they would slow to a stutter on the average laptop. Most games, including Fortnite, remain stylized. "The holy grail of all this is to cross the uncanny valley—to make a C.G. human that you can't tell is fake," Bleszinski told me. "In some ways, Tim Sweeney and his team are playing God, you know? I'm an atheist myself, but I believe that, if there is a God, the way we can honor them is by creating, because God was the original creator, allegedly." He recited some lyrics from the musical "Rent": "The opposite of war isn't peace, it's creation." "Maybe Tim Sweeney has a God complex," he said. But he suggested that it might just be that Sweeney is hyperfocussed. "I don't think he ever married, and I think Epic is his family, and Epic is his journey," Bleszinski said. "He's not much of a gamer, even. Fortnite is crushing it. But, you know, I think the engine is his endgame."

Epic's headquarters, in Cary, North Carolina, are furnished with dangling Supply Llamas—a purple piñata-like character from Fortnite—and a large metal playground slide that terminates in the lobby, at the base of a nearly two-story reproduction of a character from the Unreal series, clad in a beret and a futuristic suit of armor. (Last year, the company laid off sixteen per cent of its workforce; Sweeney cited a pattern of spending more money than the company was bringing in.) Today, some major game studios, such as Activision Blizzard, which makes Call of Duty, still use their own proprietary engines. But most rely on Unity, Unreal, and others. A number of big-budget titles—including Halo, Tomb Raider, and Final Fantasy—have recently traded their own engines for Unreal. "It's a zero-sum game," Ben Irving, an executive producer at Crystal Dynamics, which makes Tomb Raider, told me. "Do we want to be an engine company? Or do we want to be a game-making company?"

A key part of many game engines is the physics engine, which mathematically models everything we've learned about the physical world. A strong wind can be simulated using velocity. An

VISION

I watched from the earth,
low in dry grass, trying
not to breathe, blink, or stir.
Gray mist spilt from the lips
of men dressed like Pilgrims, like Custer,
like Mounties. I don't know when
I was. Or where. Everywhere,
everywhen, was the point.
Dark morning or late day, I
watched continents reunite,
watched mountains kiss and blur.
All that had been severed
was married back to itself.
Deep seams of reunification
scarred the whole of the earth,
the error of division mended—
or else it was time itself I saw,
rolling forward and back. I saw
white men unloading figures
from ships, trucks, crates. Efficient
and perfunctory, like art handlers,
only the bodies were living: bound
at the wrists, iron complicating
their necks. I strained to watch
and comprehend the system, its
logics, these agents operating
in obedience to mechanics
and nothing more. How do I say
that what I was shown I saw
from farther away than a body will

animated bubble might take into account surface tension. Last year, Epic released Lego Fortnite, a family-friendly mode in which players can build—and destroy with dynamite—their own Lego constructions. The game is cartoonish, but its mechanics are grounded in reality. "When the building falls, everybody knows what that's supposed to look like," Saxs Persson, an executive at Epic, told me. "It looks good because they got the mass right. They got the collision volumes right. They got the gravity right. They got friction, which is really hard. They got wind, terrain. All of it has to be perfect." Even the precise tension of pulling Legos apart, a common muscle memory, has been simulated. "It's all math," he said.

Yet certain things remain hard to simulate. There are multiple types of water renderers—an ocean demands a kind of simulation different from that of a river or a swimming pool—but buoyancy is challenging, as are waves and currents. "The Navier-Stokes equation for fluid simulation is one of the remaining six Millennium Prize Problems in mathematics—it's unsolved," Vladimir Mastilović, Epic's vice-president of digital-humans technology, told me, referring to a set of math problems that have been impervious to human effort. Clouds are tricky. Fabric, which stretches, bends, wrinkles, and billows, often in unpredictable ways, is notoriously difficult to get right. It's hard to simulate chain reactions. "If I chop down a tree in a forest, there's a chance that it hits another tree and knocks over another tree, and that splinters and breaks," Kim Libreri, Epic's chief technology officer, said. "Getting that level of simulation is very, very hard right now." Even the smallest human gestures can be headaches. "Putting your hand through your hair—that's an unbelievably complicated problem to solve," Libreri said. "We have physics simulation to make it wobble and stuff, but it's almost at the molecular level." (In some games, hair is simulated by using cloth sheets with hairlike texture.)

This is just one of the reasons that it's incredibly difficult to realistically simulate humans. "The solution to fluid dynamics and to fire and to all these other phenomena we see in the real world is just brute-force math," Sweeney said. "If we have enough computing power to throw at the equations, we can solve them." But humans have an intuitive sense of how others should look, sound, and move, which is based on our evolution and cognition. "We don't even know the equations we need to solve in order to simulate humans,"

ever go? Past history and argument.
Past victors and vanquishment.
Up and off. Or down and in
to the trillion atoms swirling in
every cell. Inarguable. Under
a tent in June, a whole clan
of giddy families gathered one
buggy night. Bonfire light. I was
watching from tall grass and then—
So soon? But how?—from a tree's
high bough, strung up, swaying
to the mob's intention, that old
familiar song all know or come to learn.
Before I could ache or yell, I swept
past the stars I recognize, past
the edges of this or any night,
past the clamor of humankind
until I was no longer alone, and
it was not for my own body that I cried.
Not for vengeance or mercy. Not
for any single sin, nor any blood spilt
that was not all blood. For the moan
wrung from all throats and all men
all seasons on earth. By which I mean:
Divine was the grief. The whole
unceasing universe gathered to watch
and ache as the earth whirred and spun
in its place, as the families packed up,
the armies dispersed, the rivers
swole and overflowed their banks.

—*Tracy K. Smith*

Sweeney said. "Nobody's invented them yet." Epic's MetaHuman Creator, billed as "high-fidelity digital humans made easy," is a tool for making photorealistic animated avatars. "We go to some extreme lengths to capture all the data," Mastilović said. To create one model, Epic's researchers gave an actor a full-body MRI, to scan his bones and muscles, then put him on a stage surrounded by several hundred cameras to capture the enveloping tissue. To simulate his facial movements, the researchers put sensors on the actor's tongue and teeth, placed his head in an electromagnetic field, and collected data on the ways his mouth moved while he talked.

MetaHuman Creator draws on a database of scanned humans, a kind of anthropoid slurry, to create highly detailed virtual models of people, often used for secondary characters in games. Currently, the avatars' movements are not quite right: they're overly smooth and a little slippery; their mouths move oddly; they struggle to make eye contact, which is unsettling. When I launched the application recently, a default MetaHuman named Rosemary emerged on my computer screen, blinking and gently twisting her head back and forth. Rosemary was white, with blue eyes and slightly yellowing under-eye bags. She appeared not to have got much sun lately; I touched her up with a little blush. Using sliders, I adjusted her eyes—color, iris size, limbus darkness—lengthened her teeth, dialled up the plaque, and gave her freckles. I selected "happy" from a list of emotional states. Rosemary smiled and tilted her head in different directions, like a royal in a coronation procession. I changed her hair style to a Pennywise coiffure. My husband came into the room. "What the fuck is that?" he said.

Fortnite, which is made with Unreal, is a cultural phenomenon, with about a hundred million monthly players. Its most popular mode is Battle Royale, in which players blast one another with weapons. But there are also more social modes. There are now live concerts in Fortnite, attended by millions of people. There are shops, where real people spend real money to buy virtual goods for their virtual avatars. (Epic settled a lawsuit with the F.T.C. last year, for violating minors' privacy and manipulating them into unwanted purchases, and paid more than half a billion dollars.) There is a comedy club run by Trevor Noah, and a Holocaust museum. In February, Disney invested $1.5 billion in Epic, for a nine-per-cent stake in the company; Bob Iger, the C.E.O. of Disney, has said that he

plans to create a Disney universe in Fortnite, in which players can interact with the company's intellectual property. Epic views Fortnite as a "platform," and encourages players to create, sell, and build with their own digital assets. Photogrammetry apps can be used to make assets of everyday items—a chair, a blouse, a bowl of noodles. In theory, a person could make a digital asset of her orthodontic retainer, sell it to other "creators," then place it on her virtual bedside table and forget about it.

Mastilović suggested that MetaHumans could one day be used to create autonomous characters. "So it will not be a set of prerecorded animations—it will be a simulation of somebody's personality," he said. He suggested that a simulation of Dwayne (the Rock) Johnson could be fun, and that people could create digital copies of themselves and then license and monetize them. Mastilović's team often talked about a concept called Magic Mirror: a way to visualize, alter, and explore oneself virtually. "What if I was ten kilos more, ten kilos less?" he said. "What if I was more confident? What if I was older or younger? How would this look on me?" He added, "When things become truly real, photo-real, and truly interactive, that is so much more than the medium we have right now. That's not a game. That's a simulation of alternate reality."

The video-game industry and Hollywood have long been symbiotic, but the lines have become increasingly blurred. When James Cameron began making "Avatar," in the mid-two-thousands, he announced that he would replace traditional green screens with a new technology that he called a "virtual camera." Actors performed on a motion-capture soundstage, wearing bodysuits covered in sensors, while video of their bodies and faces was fed into proprietary software similar to a game engine. Using a specialized camera, Cameron was able to see the actors, in real time, moving around the computer-generated world of Pandora, a lush, vegetal moon. "If I want to fly through space, or change my perspective, I can," he told the *Times*, in 2007. "I can turn the whole scene into a living miniature and go through it on a 50 to 1 scale." The crew called the technique "virtual production." Behind-the-scenes footage showed actors, faces freckled with sensors, aiming bows and arrows on a starkly lit soundstage. On Cameron's screen, the actors were sleek and blue, tails gently bobbing.

At the time, using virtual reality for filmmaking was prohibitively expensive. But in the past ten years a confluence of factors, including cheaper L.E.D. screens and better commercial game engines, has brought it into wider use. The term "virtual production" is now used for a number of filmmaking techniques. The most prominent application is as an alternative to a green screen. Actors work on a soundstage called a "volume," which has a curved back wall and is covered in thousands of L.E.D. panels; the ceiling is panelled, too. The panels display backdrops—a mountaintop, a desert, a hostile planet—that are made in a game engine, and can be adjusted in real time. (The effect is something like an updated version of rear projection, an early-twentieth-century technique in which film was projected behind an actor.) Unlike with a green screen, actors can see the world that they're meant to inhabit. They are lit from the L.E.D. panels, and thus don't assume the telltale green-screen tint. The camera and the engine are in communication, so when the camera moves the virtual world can move with it—much like in a video game. (Baz Idoine, the cinematographer for "The Mandalorian," called this effect, known as parallax, a "game changer.") There are now several hundred virtual-production stages in operation, including at Cinecittà, the landmark Italian film studio. Julie Turnock, a film-studies professor at the University of Illinois Urbana-Champaign, said that such virtual methods were likely to become "the dominant form of production." This year, N.Y.U. will begin offering a master's in virtual production, at a new facility funded by George Lucas and named in honor of Martin Scorsese. Both Epic and Unity have received Emmy Awards for their game engines.

In 2021, Epic set up shop in a large warehouse in El Segundo, California, that holds two L.E.D. volumes. When I visited, last year, the company was hosting a workshop for cinematographers. People milled about, exploring virtual environments using V.R. goggles. Up on one volume was a hundred-and-eighty-degree view of a Himalayan plateau, where it was daybreak. The light was clear and cold. I stood in the middle of the stage, surrounded by virtual mountains, and considered the inclusion of two virtual tents: Whose were they? The thought suggested that I was having an immersive experience. But did this view exist, or was it a collage—Himalay-ish? Clouds rushed overhead, and a string of multicolored flags flapped in a breeze that we could not feel. Several yards away, a technician entered a few commands into a computer, and the clouds and the stage glowed coral—golden hour. "I'm going to move some mountains for you," he said, and a snow-covered mesa floated across the set.

On-set virtual production is often cheaper and safer than sending a cast to far-flung places. "There have been cases where we just travel to a real-world location, like Iceland or Brazil, to scan some really large terrain pieces," Asad Manzoor, an executive at Pixomondo, a virtual-production and visual-effects company owned by Sony Pictures, said. "We take those scans into Unreal, reshape them, cobble them together to create an alien planet." The idea is to create something "photo-real but alien." For multi-season series, like "Star Trek: Strange New Worlds," it's cheaper to store sets in the cloud than in a hangar. Virtual characters, like MetaHumans, can now be used for crowd scenes—a sticking point in negotiations between studios and the Screen Actors Guild last year. Several people I spoke with brought up the convenience of not having to worry about the weather: it is, after all, always sunny in Barbie Land. For that movie, a scene parodying "2001: a Space Odyssey," in which a cadre of little girls in a desert encounters a humongous doll wearing a kicky bathing suit, was shot in an L.E.D. volume; it would have been challenging to schlep

child actors to Monument Valley, where the original was filmed.

Game engines can also be used for previsualization, including virtual scouting, which relies on 3-D mockups of sets. The virtual models are often created before the sets are built. "Everything that was happening in Barbie Land we technically had a real-time version of, for scouting," Kaya Jabar, the film's virtual-production supervisor, said. The effects department put up model environments on a small L.E.D. volume for the movie's director, Greta Gerwig, and its cinematographer, Rodrigo Prieto, to explore. "They would walk around with a viewfinder, with the correct lens and everything, and just get a sense: Does this feel right? Are the palm trees too tall?" Jabar said. Sometimes the models are of real-world locations: during preproduction for "Dune: Part Two," the cinematographer planned shots using a model of the Wadi Rum desert, populated with MetaHumans, before filming in Jordan. When I spoke with Sweeney, he reflected on how widespread the use of scans had become. "They're all isolated into their own separate projects, kept in some corporation's vault," he said. "But if you take all of the 3-D terrain data and all of the 3-D object data and you combined it together, right now I bet you'd have about ten per cent of the whole world."

Nonetheless, virtual production presents difficulties. It's hard to establish distance between actors, since a volume can be only so large. Some directors resort to digi-doubles—animated scans of an actor. Aligning a digital set with a physical stage can be a challenge. "We have a game at the studio that we call Find the Seam," Manzoor told me. "That's always the dead giveaway." Then there is the opposite problem: on the fourth season of "Star Trek: Discovery," Manzoor said, "it got to a point where it was so seamless that we had an actor nearly walk into the wall just because they thought it was a continuation of the practical set." Idoine told me, "The volume is the right tool for the right job. It's not the right tool for all jobs."

Decisions about lighting, scenery, and visual effects have to be made in advance, rather than in postproduction. In 2019, the director Francis Ford Coppola announced that he was developing "Megalopolis," a project he first conceived of in 1979, and that the movie would be made using virtual production. The film is a science-fiction epic about an architect, played by Adam Driver, who wants to rebuild New York after a catastrophe. For one scene, the team made a physical replica of the top of the Chrysler Building, overlooking a version of the city built in Unreal. Mark Russell, the visual-effects supervisor, said, of Driver, "He was standing up on this platform that was just a couple of feet off the ground but surrounded by a view of New York, and it was beautiful. Just to watch him kind of live in that environment was pretty spectacular." But last year Coppola fired the visual-effects department and traded the volume for a classic green-screen approach. "Francis wasn't prepared to define what Megalopolis was," Russell said. "He'd been developing this idea for forty-some years, and he still was not willing to choose a direction as to what the future would look like."

Virtual production still works best when dealing with fantasy worlds, for which viewers have no direct references. "We all have an intuitive understanding of how things move in the real world, and creating that sense of reality is tough," Paul Franklin, a principal at the visual-effects house DNEG, said. Turnock, the film-studies professor, noted that visual realism isn't always about imitating "what the eye sees in real life." She brought up filmmakers' use of visual elements like shaky camerawork and shafts of light glittering with dust motes—gestures toward realism whose presence is sometimes gratuitous, or even defies logic. (These have also become common in video games: there are no cameras in video games, but there are lens flares.) Turnock traces this back to efforts in the seventies and eighties to make the early "Star Wars" films look gritty and naturalistic. "There's a whole series of norms that have grown up around what makes things look realistic," she said. Some attempts at realism, it struck me, were so realistic that they could only be fake.

In El Segundo, Epic has an office in a large, loftlike area above one of the stages. When I visited, the space looked as if it had been furnished using a drop-down menu: a couple of gray sofas; a mid-century-style leather chair; a bookcase holding some awards and tchotchkes alongside "The Illusion of Life," a history of Disney animation, and "Thinking of You. I Mean Me. I Mean You," by the artist Barbara Kruger. Next to the bookcase was a plastic fiddle-leaf fig, which complemented a nearby bowl of plastic moss. "More and more, it's become digital-first," James Chinlund, the production designer for "The Batman" and the live-action remake of "The Lion King," told me, sitting in the loft. He pointed to a poster on the wall, an evening cityscape from an Epic-produced game that was based on the "Matrix" franchise. The rendering was so detailed that gray ceiling tiles could be seen through the windows of the office buildings. "If we had to actually build that

"No, son. Let him finish."

space, it'd be overwhelming," he said.

Still, Chinlund wondered if the digital turn might produce "lazy filmmaking." "The audience is going to get bored with having all the candy delivered to them," he said. He suggested that there might eventually be a backlash to the industry's technological advancements. "I have fantasies about the idea that craft is going to come swinging back—this punk-rock aesthetic," he said. Lately, there has been an emphasis on more analog techniques: the director Christopher Nolan has touted the absence of C.G.I. in his film "Oppenheimer." (The detonation of the atomic bomb was simulated using explosives and drums of fuel.) Chinlund framed the issue as a matter of creative storytelling. "If you don't have it available to you to put in the mountain belching lava with dragons flying around, then how do you communicate what the knight is seeing when he's standing on the cliff?" he said. "Now the fact is that you can do that in a fully accurate, photo-real way. And is that better? Often not."

Today, it's polygons all the way down. Tesla uses a game engine for its in-vehicle display, which shows a real-time visualization of the car on the road, from above. BMW trains its autonomous-driving software on data gathered from simulated scenarios between virtual cars in virtual environments. The Vancouver Airport Authority uses a "digital twin," made with Unity, to test safety and operational scenarios, incorporating real-time data from the physical airport. Disneyland features a "Star Wars" ride in which visitors fly the Millennium Falcon through a galaxy that is responsive in real time, because it's built with Unreal Engine. Last year, the country musician Blake Shelton, on his Back to the Honky Tonk tour, performed against a virtual backdrop that evoked a honky-tonk bar—also Unreal—with simulated neon marquees and highway signs. A South Korean entertainment company recently unveiled MAVE, a K-pop group of MetaHumans. In music videos, MAVE's four members—lithe young women with long torsos, glossy hair, and unblemished skin—bounce around synthetic cityscapes doing synchronized dances. Their movement is a little stiff, as if they were overthinking the choreography. Still, human dancing has seen worse.

Digital artists can now use any number of marketplaces to shop for assets. One of Epic's, called ArtStation, includes boxy leather jackets ("streetwear"), a thirty-pack of mutant-skin templates, and a collection of images titled "910+ Female Casual Morning Poses Reference Pictures," which show a naked woman stretching, reading a book called "Emotional Intelligence," and shadowboxing with a pillow—just casual morning stuff. Carmakers and product designers use game engines to create mockups, because it's cheaper than building prototypes. Last fall, the Sphere, an enormous L.E.D.-covered entertainment venue in Las Vegas, appeared to have been doused in waves of Coca-Cola—part of a promotion for Coke Y3000, a new flavor "co-created with human and artificial intelligence." To pitch the ad, the agency behind the promotion, PHNTM, modelled the Sphere and its surrounding neighborhood in Unreal. "It's very easy to see how it's going to look from the Wyndham golf course, from this or that area," Gabe Fraboni, the agency's founder, told me. Last summer, the agency installed an L.E.D. volume in its office.

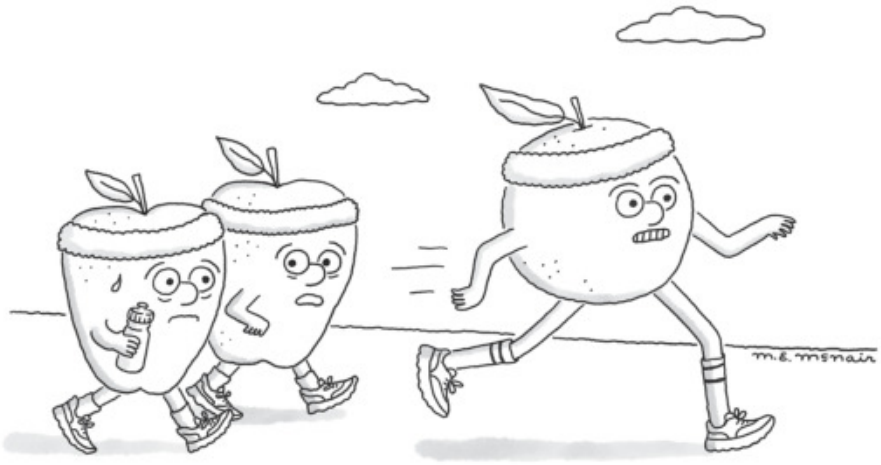
In 2020, Zaha Hadid Architects used Unreal to model a proposed luxury development in Próspera, a controversial private city—and a special economic zone, marketed as a haven for cryptocurrency traders—on an island in Honduras. (Locals oppose it, fearing displacement, surveillance, and infrastructural dependence on a libertarian political project.) Prospective homeowners could scout plots of land and personalize their own residences with curved thatched roofs and rounded terraces. "Want to check out the view from the balcony?" marketing materials asked, seductively. Last year, Epic worked with Safdie Architects to create an elaborate model of a completed Habitat 67, Moshe Safdie's unfinished utopian development in Montreal, which never got the authorizations necessary to realize Safdie's vision. The brutalist architecture looks gorgeous in the virtual light. Chris Mulvey, a partner with the firm, said that when Safdie saw it his response was bittersweet: "He was just, like, 'If I'd had this, I could have convinced them to build the whole project.'"

The same tools have been used to archive disappearing aspects of the physical world. Shortly after Russia invaded Ukraine, in 2022, Virtue Worldwide, an ad agency, began working on Backup Ukraine, an ad campaign for UNESCO and Polycam, a photogrammetry company. The campaign asked volunteers to create digital assets of antiquities, monuments, and everyday artifacts that were under threat, including sculptures, classical busts, and headstones. ("How do you save what you can't physically protect?" it asked.) The original idea was to use the assets as blueprints for future reconstruction, if necessary—a professional team of scanners created meticulous models of churches in Kyiv and Lviv—but people also began uploading scans of everyday objects from their own lives. Alongside models of an exploded tank, a burnt-out car, and destroyed apartment buildings are assets of a toy Yoda and a pair of worn-out Chuck Taylors.

Within a decade, Sweeney told me, most smartphones will likely be able to produce high-detail scans. "Everybody in humanity could start contributing to a database of everything in the world," he told me. "We could have a 3-D map of the entire world, with a relatively high degree of fidelity. You could go anywhere in it and see a mix of the virtual world and the real world and any combination of real and simulated scenarios you want there." In recent years, Sweeney has started talking up the metaverse: a vision of the future in which people can move seamlessly between virtual environments, taking their identities, assets, and friends with them. In 2021, when metaverse chatter reached a fever pitch, the idea was sometimes discussed as a replacement for the white-collar office in a world of remote work. That year, Facebook rebranded itself as Meta, then released a demo of its own metaverse: a spooky, squeaky-clean office space in which legless avatars floated around virtual conference tables. Sweeney sees the metaverse more as a space for entertainment and socializing, in which games and experiences can be linked on one enormous platform. A person could theoretically go with her friends to the movies, interact with MetaHuman avatars of the film's actors, drop in on an Eminem concert, then commit an act of

Surprise

When one has been married forever...
HAPPY Millionth ANNIVERSARY!
1,000,000
...one sometimes feels that there is nothing new one will ever discover about one's person.
SIGH SIGH SIGH
HOWEVER, every so often, one is surprised.
Related to Al Capone
Tongue-twister champion 1985
Childhood giraffe phobia
When I was in eighth grade, I invented a cartoon character named Ugly Moe...
Excuse me?!?
He had a hole in the middle of his body and stood in front of a billboard. You could read part of the billboard through the hole.
I think it would be best if you drew this right now.
EAT AT MOE'S
Did the billboard ever say anything else?
Nope!



"You can't compare apples and oranges, because oranges have longer legs."

• •

ecoterrorism in Próspera, all without changing her mutant skin.

By this point in our conversation, Sweeney had stopped vibrating, and seemed more relaxed. He described the metaverse as an "enhancer"—not a replacement for in-person social experiences but better than hanging out alone. "The memories you have about these times, and the dreams you have, are the same things that you would have if you had been in the real world," he said. "But, you know, the real world wasn't available at that time." He joked that the "light source to the outdoor world"—the sun—is available only half the time. But the metaverse is always switched on. Sweeney and some of his friends from the gaming industry, most of whom live in different cities, have their own Fortnite squad, and often get together in the evening to maraud around and talk business. It hadn't occurred to me that the people making Fortnite would also hang out there. I wondered if he had ever inadvertently picked off one of his employees.

In the fall, videos of military conflict, purporting to be from Gaza, began circulating on social media. "NEW VIDEO: Hamas fighters shooting down Israel war helicopter in Gaza," one tweet read. But similar videos had circulated some months prior, purporting to be footage from Ukraine. In fact, they were from Arma 3, a video game. Bohemia Interactive, the game's developer, released a disinformation explainer that read a bit like an advertisement: "While it's flattering that Arma 3 simulates modern war conflicts in such a realistic way, we are certainly not pleased that it can be mistaken for real-life combat footage." (In 2004, a defense contractor modified the game to create a training simulation for the U.S. military.)

The military has experimented with using games as training tools since the seventies, and has been integral to the development of computer graphics and tactical simulators. As game engines have become more sophisticated, so have their police and military applications. The N.Y.P.D. has held active-shooter drills in game-engine simulations of high schools and of the plaza at One World Trade Center, in which animated characters lie bleeding on the ground. Raytheon has used game engines to simulate the deployment of new military technologies, including autonomous drone swarms and fleets of unmanned ground vehicles in dense cities. Boeing is using Unreal to create virtual models of its new B-52 bombers. (The models are also available on the Unreal Engine marketplace.) In many cases, simulators are less focussed on photorealism and more concerned with physical, mechanical, and even sonic realism. They can be personalized, and the data they produce can be used to customize an individual's training. Munjeet Singh, who works on immersive technologies for the defense contractor Booz Allen Hamilton, told me that the company uses EEGs to monitor pilots' emotional responses to flight simulations created in Unity, in which, say, their engine fails or their plane gets shot at. "We can see if that alpha brain wave is active, the beta brain wave, and then we can correlate that to focussed attention, attention drifts, sometimes emotional states," Singh said. Members of the military who have P.T.S.D. from real-life conflicts—for which they may have trained in virtual reality—are now treated for P.T.S.D. in virtual reality.

Naval Air Station Corpus Christi is a military base on a small, squat peninsula on the Texas coast. Between the base and the Gulf of Mexico is Mustang Island, a popular destination for vacationing families, who visit the "Texas Riviera" for its affordable condominiums, dolphin cruises, deep-sea-fishing tours, and wobbly gobs of ice cream scooped from industrial-sized tubs. The main drag displays a grab bag of architectural references: Ionic columns under a gable roof; a private residence with a castle turret and barrel-tile roofing. As in many other coastal areas of the United States, the cars are trucks; the lawns house motorboats. The local mixed-martial-arts gym is named Weapons at Hand. I visited in midsummer, during a weather pattern that was still being referred to as a heat wave, possibly a world-historical euphemism. On the morning of my visit to the base, I stood in the lobby of a Best Western, waiting for a cab and watching television. On the Weather Channel, a broadcaster stood in a virtual set, designed in Unreal Engine, talking about the dangers of getting trapped in a vehicle during hot weather. Beside him was a life-size digital asset of a sedan, the inside of which appeared to be on fire. A dial labelled "SCORCHING CAR SCALE" leaned three-quarters of the way to the right.

On the base, which is dedicated mostly to aviation training, people walked around quietly and with good posture, their flight suits swishing. The training buildings contained a variety of simulators. There is a national pilot shortage, and a number of people had mentioned that they were excited to bring attention to the Navy's use of technology, which they hoped would attract a new generation

of digital natives to military aviation. (In the past, the military has recruited at video-game conventions.) Joshua Calhoun, a Navy commander, led me to a virtual-reality sled designed to resemble the small cockpit of a kind of two-seater prop plane that I'd seen outside. I climbed inside and put on a V.R. headset. When I looked down at my lap, my legs were gone. The simulation environment, made in Unity, was a model of the base's airstrip outside. "Where they're operating—active duty—right now, today, is here in Corpus Christi," Calhoun explained. "I could probably create a scenario where they're operating in Iraq or Afghanistan, but what's the training value for that?" The virtual wind, visibility, and weather could all be adjusted, but for me the day was clear—easy mode.

"I'm going to put you up over the bay," Calhoun said, and skipped ahead in the simulator. "You may want to close your eyes." A few seconds later, I found myself above Nueces Bay, alone in the sky. The traffic, marvellous in its way, moved mathematically below. Boats drifted in the water. On base that day, it had been mentioned, multiple times, that a perk of living in Texas is that it's legal to drive on the beach. It was strange to see Corpus Christi broken down into assets, when the things that made the city interesting were contextual: the region's industrial history and changing climate; the coexistence of tourist, oil-and-gas, and military infrastructure; the massage parlors around the base. "I'm not super interested in ground detail," Calhoun said.

I flew over a Citgo plant, thinking about the entanglement between the video-game industry and the armed forces, a dynamic sometimes referred to as the military-entertainment complex. Games were repurposed as military training tools; military training tools were repurposed as games. The latter were popular in part because they had a certain legitimacy: the industry aspired to realism, after all. Among the many Doom modifications in the nineties was Marine Doom, a military simulator created to train marines in tactical decision-making; a version of Doom has since been used to train an A.I. system integrated into a new model of tank used by the Israel Defense Forces. I heard Calhoun say something about altitude control, but I wasn't paying attention. I couldn't see the forest for the trees—too distracted by their polygon count.

"You're going to hit the water," he said.

A few weeks after I chatted with Sweeney, I went hiking with a friend in the Oakland Hills. It had rained overnight, and the air was cool and mossy; the trails were slick with heavy mud. I had spent the previous few days at this year's Game Developers Conference, wandering around the basement of a convention center and watching people stumble about in V.R. goggles and eat fat chocolate-chip cookies from Epic's two-story pavilion. It was a relief to now be aboveground. We walked slowly along the edge of the trail, our sneakers feeling for traction.

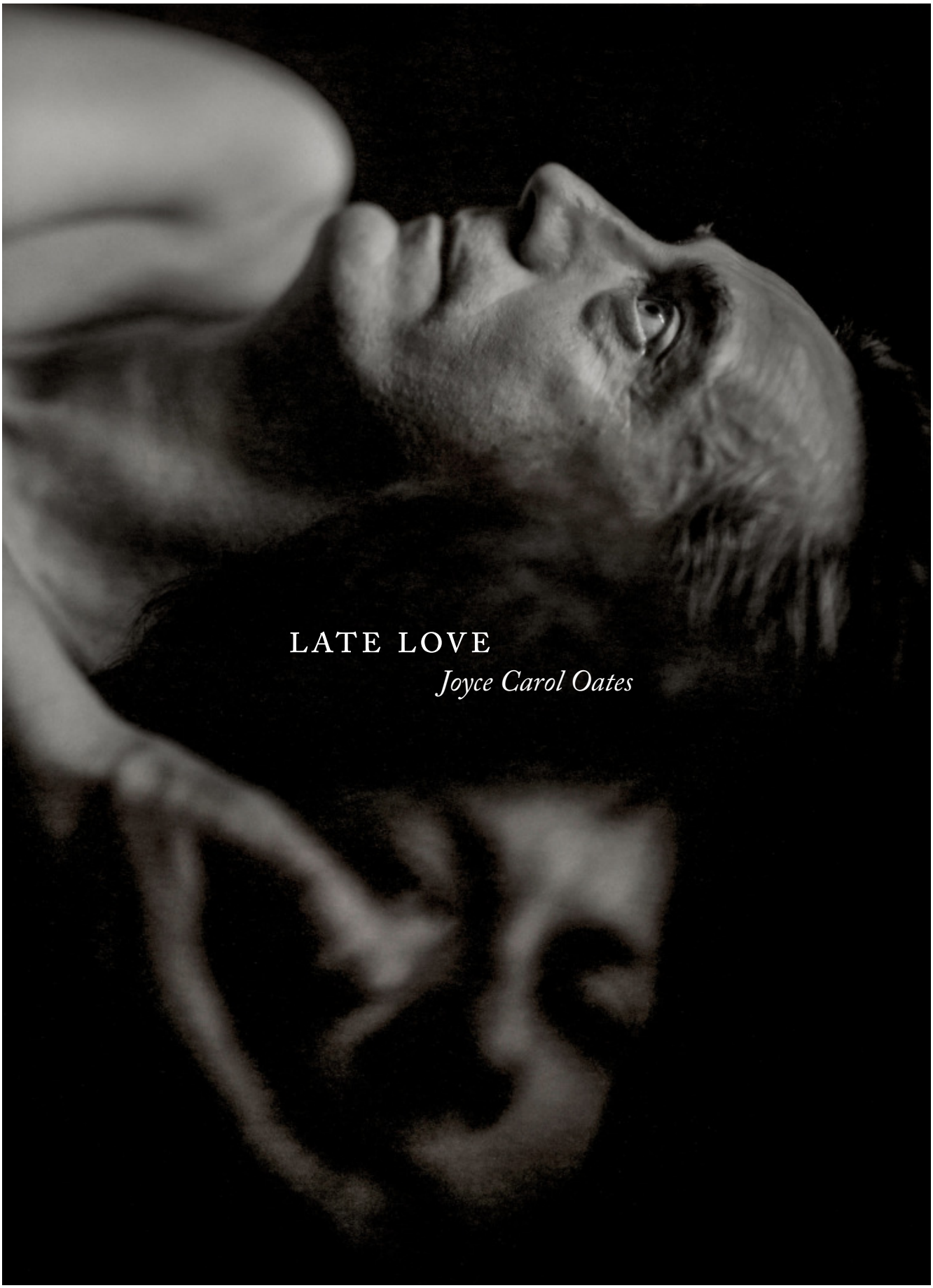
In the past decade, Sweeney has become one of the largest private landowners in North Carolina, buying up thousands of acres for conservation. Land conservation struck me as an interesting project for someone in the business of immersive indoor entertainment—incongruous enough that I found it kind of moving. (In a 2007 MTV documentary, Sweeney showed off his garnet collection, some of which was acquired on eBay, and a "climbing tree" in his yard.) When we spoke, I asked Sweeney whether working in games had made him see nature differently. "Natural scenes tend to be the hardest to simulate," he said. "When you're standing on a mountaintop, looking out into the distance, you're seeing the effect of trillions of leaves of trees. In the aggregate, they

don't behave as ordinary solid objects. At a certain distance, trees become sort of transparent. When you look at the real world and see all the areas where computer graphics are falling short of the real world, you tend to realize we have a lot of work yet to do." He speculated that an efficient, realistic simulation of a forest would require a "geology simulator" and an "ecology simulator," each with its own complex sets of rules.

In the hills, I thought about what it would take to make a digital version of the landscape we were moving through: the way the mud swallowed the yellow leaves and frail sticks; the silty puddles reflecting strips of sunlight; scum accumulating against the rocks in the creek; the checkered pattern of light across the bark of a redwood; the drainage pipe at the edge of a clearing—a reminder that this environment was engineered, too. (We'd split an edible.) The creation of virtual worlds seemed to require paying an incredible amount of attention to the natural one: when I'd asked Michael Lentine, Epic's lead physics engineer, what it took to simulate a tidal wave, his answer began with an overview of Eulerian and Lagrangian physics. In gaming, there's a concept called immersion breaking, which occurs when something snaps a player out of the narrative flow—permeable walls, characters who float rather than walk. The foliage matters.

My friend and I talked about Big Basin, a state park that was home to some of California's oldest redwoods. A few years ago, it suffered a terrible wildfire. I toured the park shortly after the fires, and found it devastating. But the trees were now trucking along. There was an archival impulse to scanning that I found appealing, even as I wondered if there was an anxiety to it, too. Was there something bleak about creating virtual facsimiles of the natural world while we as a species were in the process of destroying it? Lind, the Quixel co-founder, told me that he had gone on a scanning trip to Malibu in 2018. His team spent a week scanning the Santa Monica Mountains, capturing the texture of the landscape. Two weeks later, the Woolsey fire burned almost a hundred thousand acres of land in the area. "That was actually fairly emotional," Lind said. "Every scanning expedition, you develop a certain connection with that place." Still, they had the scans. Today, those images could be scattered across games and movies, in jumbled pastiches of the real thing.

We reached a part of the creek that was shrouded with ferns. Ribbons of foam formed in the water. My friend offered me his baseball cap, the crown still warm. We were on the downslope, inescapably, and it had started to rain. ♦



LATE LOVE

Joyce Carol Oates

ANDREA MODICA, "MODENA, ITALY"

They were newly married, each for the second time after living alone for years, like two grazing creatures from separate pastures suddenly finding themselves—who knows why—herded into the same meadow and grazing the same turf.

That they were "not young," though described by observers as "amazingly youthful," must have been a strong component of their attraction to each other.

K__, a widow, and T__, divorced a decade previously (from a woman who was now deceased), each lonely amid a busy milieu of friends and colleagues. The widow believed herself more devastated by life than the new husband, whose reputation as a historian and a public intellectual reinforced the collective impression that he was a man whom life had treated well. Only she, once she was his wife, understood how self-doubting the husband was, how impatient with people who agreed with him, flattered him, and looked up to him.

"Excuse me, darling. Thank you very much, but *don't humor me.*"

This remark, uttered to the wife in private, was both playful and a warning.

Soon after they were married, and living together in the husband's house—the larger and more distinguished of their two houses, a sprawling, five-bedroom, dark-shingled American Craftsman with national-landmark status, on a ridge above the university—the husband woke the wife in the night, talking in his sleep, or, rather, arguing, pleading, *begging* in his sleep, in the grip of a dream from which the wife had difficulty extricating him.

The wife was awakened with a jolt. Scarcely knowing who this agitated person beside her was, his broad sweaty back to her, in what felt like an unfamiliar bed with a hard, unyielding mattress and a goose-feather pillow that was not at all soft, in a room whose dimensions and shadowy contours were alien to her.

Gently, the wife touched the husband's shoulder. Gently, she tried to wake him, not wanting to alarm him. "Darling? You're having a bad dream."

With a shudder, the husband threw off the wife's hand. He did not awaken but seemed to burrow deeper into the dream, as if held captive by an invisible, inaudible adversary; he did not want to be rescued. The wife was fascinated, though alarmed, by the way the husband had worked himself up into a fever state—the T-shirt and shorts he wore in lieu of pajamas were soaked through, and his body thrummed with an air of frantic heat, like a radiator into which steaming-hot water has rushed unimpeded. Fascinated, too, by the husband's sleep-muffled words, which were *almost* intelligible. Like words in a foreign language that so closely resembles English you are led to think that meaning will emerge at any moment.

Yet none did. And now the husband had begun grinding his teeth as well as muttering.

He appeared to feel cornered, threatened. A low growl in his throat became a whimper, a plea. His legs twitched as though he were trying to run but could not because his ankles were bound.

Still, the wife hesitated. It seemed wrong to forcibly wake a person so deeply asleep and yet equally wrong, or worse, not to wake him from a nightmare. The wife recalled that when she was a girl an older relative was said to have died in his sleep of a massive heart attack, which his wife claimed had been caused by a nightmare. But might his wife waking him have precipitated the heart attack? Or might the impending heart attack have precipitated the nightmare?

Cautiously, the wife shook the husband's shoulder again, hard enough to wake him mid-whimper.

Sudden silence in the husband—even his labored breathing ceased, and, in an instant, he was fully awake, holding himself rigid as if in the presence of an enemy.

Without touching him, the wife could feel the husband's racing heartbeat. The bed quivered with his terror.

"Darling? Are you all right? It's just . . . It's me."

And: "You were having such a bad dream. You were talking in your sleep."

But the husband did not turn to her.

How strange this was! The muttering, pleading, and whimpering, and now this reaction. Totally unlike the husband in his waking life. . . .

How unlike, too, the wife's first husband, who in thirty-six years of marriage had never once talked in his sleep, at least not like this. Never moaned or thrashed in a nightmare.

Close beside the husband, the wife lay hoping to calm, console, comfort, not by speaking further but with the solace of intimacy, as one might soothe a frightened child, allowing the husband to sense her presence. To hear her own, even breathing. *It's just me. Your wife, who loves you.*

Naïvely, the wife supposed that in another moment or two the husband (ordinarily affectionate, sensible, matter-of-fact) would grasp the situation, throw off the nightmare, turn to gather her in his arms.

Except: had the husband possibly forgotten her? For theirs was a new marriage, not a year old. A lamb with spindly legs, uncertain on its feet. Vulnerable to predators.

Each day came a flurry of kisses, light and whimsical as butterflies. Silly jokes passed between them. Each was grateful for the other. Especially, the wife was grateful for the husband. But how long could this idyll last?

Finally, tension drained from the husband's body. His shoulders relaxed; he breathed more regularly. Lapsing into a normal sleep.

Thank God! The wife felt enormous relief, as if she'd narrowly avoided danger.

Positioning herself to face outward, staring at the shadowy wall, the wife willed herself to rest, to fall asleep, even as, to her dismay, she began to hear a *click-clicking* sound behind her.

Alert and alarmed, the wife listened. Was this sound the husband's *teeth*?

His jaws were trembling convulsively, it seemed. As if he were very cold, shivering with cold. An eerie sound that stirred the hairs at the nape of the wife's neck.

Again! The low, fearful, aggrieved muttering. What was the husband *saying*? The wife listened, now fully awake.

Now miserably awake. Despairingly awake.

Trying to decipher the garbled words. Rough syllables of sound. Like grit flying in the air. The wife was filled with dread. Did she really want to know what the husband was saying in his sleep?

Wondering, too, if it was even ethical

to eavesdrop like this. Especially on a husband in such a vulnerable state. As if his soul were naked.

In their daylight life, the wife would not have eavesdropped on the husband if she'd overheard him on the phone, for instance. Especially if he were speaking with such fervor.

Any sort of speech not directed consciously toward her the wife would have been hesitant to hear.

It was distressing to her that the (sleeping) husband bore so little resemblance to the man she knew, who had a deep baritone voice and exuded an air of imperturbable calm.

The man she knew stood well over six feet tall, with broad shoulders, a head of thick coppery-silver hair that flared back from his forehead, eyes that crinkled at the corners from smiling hard throughout his life. Swaths of coarse hair sprouted in his underarms, on his forearms and legs, on his back. The wife had never heard this man plead or whimper or whine.

The man beside her in the bed seemed both shorter than the man she knew and thicker, with a sweaty back that looked massive. The wife seemed to know that the (sleeping) husband's belly would be slack, sagging with gravity. His genitals would be heavy yet flaccid, fleshy skin sacs reddened with indignation, like the wattles of an angry turkey.

As the wife listened, it seemed evident that the (sleeping) husband was engaged in some sort of dispute, in which he was, or believed himself to be, the aggrieved party; he was being teased, tormented, tortured. He was being made to *grovel*. Was the husband reliving a dispute with someone at the university? He'd retired as chair of the history department after twelve years, a remarkably long tenure for a university administrator; he was still active in university and professional affairs, and published frequently in his field of medical history.

All of this the wife had learned from others. For the husband's manly vanity was such that he would never stoop to boasting of his accomplishments; nor would the wife have been comfortable if he had.

Of his previous marriage the husband rarely spoke. Nor did he encourage the wife to speak in any detail about her life before she'd met him.

The first, deceased wife was a person few people talked about, though she was the mother of T__'s several adult children, now living in distant states.

She, the (new) wife, was hesitant to ask the husband personal questions. Out of shyness, fear that the husband would rebuke her, be annoyed.

She was so grateful to him for having tossed her a lifeline, a rope she had grasped to pull herself out of the seething muck of despair.

Many a night after the death of her first husband she'd considered taking her own life. Mesmerized by the grammar: *Taking her own life—but taking it where*?

"Darling, please! *Wake up.*"

Harder than she'd intended, the wife pushed the palm of her hand against the husband's back.

"What! What's wrong?" The husband woke abruptly.

"Darling, please, it's just me. Are you all right?"

The wife could hear the husband breathing. She could picture his teeth bared in a glistening grimace, rivulets of oily sweat on his face.

"You've been having terrible dreams."

She groped to switch on the bedside lamp, which was a blunder: fiercely the husband scowled over his shoulder at the wife, shading his squinting eyes against the light as if it were not a low-wattage bedroom light, the soft glow of

marital intimacy, but a blinding beacon causing him pain.

"Jesus! It's 3 A.M. Did you have to wake me up?"

"But you've been having a nightmare."

"*You've* been having a nightmare! Every goddam time I try to sleep you've been waking me up. Turn off that damn light. I have an early morning tomorrow."

The wife quickly fumbled to turn off the lamp. She was speechless with surprise, chagrin. She could not even stammer an apology. Stunned by the husband's face in the lamplight, contorted with fury and disgust and a kind of humiliation that she, the wife, the new wife, had seen him so exposed, rendered helpless by a nightmare.

The first time we see the other unclothed: the shock of the physical being, the *bodily self*, for which nothing can prepare us.

"I am so, so sorry. Can you forgive me?"

The wife had to wonder if the marriage had been a mistake.

A *mis-take:* taking something or someone for what he is not. *Mis*-apprehending.

The man the wife knew, or would have claimed to know, never behaved childishly, vindictively, foolishly. He was a handsome man who carried himself with dignity, confidence. He was easy-going, gracious, soft-spoken. He dressed casually but tastefully. He wore wire-rimmed glasses that gave him a youthful, scholarly look appropriate to his position in life. If he felt disapproval, he was likely to express his opinion quietly. That man did not make faces. He did not betray anger, rage.

The face of the man roused from sleep was rawly aggrieved, accusing. It was not a handsome face but coarse, fleshy. Its flushed skin was creased with fine wrinkles, and the eyes, lacking the wire-rimmed glasses, were as puffy and red as the eyes of a thwarted bull.

In such a panicked beast there is danger, the wife knew, and she shuddered.

All of this was ridiculous! Of course.

The sort of thing one thinks only at night.

The husband slept, the wife lay awake listening to the husband's heavy breathing. Thank God this seemed to be an ordinary sleep.

Now, in this precarious calm, the wife began to question what had happened. Thinking the husband might not have seen *her*, exactly. He'd been surprised by being roughly awakened; his brain had not been fully functioning.

This was altogether plausible. This was consoling, though problematic: *If my husband is not seeing me, then who is he seeing*?

By degrees, the wife sank into sleep. A warmly murky penumbra rose to en-

velop her, like mud stirred in water.

On a beach, in cold, brittle sand, she was trying to walk barefoot without turning an ankle, a frothy surf sweeping over her feet, washing unspeakable things onto the sand: wriggling transparent jellyfish, squirming dark-splotched eels, ravaged eyeless fish, skeins of fetid seaweed. And one of these unspeakable things was the thought that the husband had (possibly) murdered the last woman who'd slept in this bed in the American Craftsman house on a ridge above the university, which had come to be a landmark in the community, at which the wife herself had stared from time to time in admiration, though not envy.

This was the explanation! The husband with rage-engorged eyes had seen another woman in the bed. The (former) wife, surely. He'd murdered her in his sleep in a rage. Because she'd seen him naked, in the sweat-soaked T-shirt and shorts. Peered into his craven soul.

No man will forgive a woman for having seen him broken.

Had he strangled her? The husband did have strong hands.

For how else could a husband impulsively murder a wife in their bed? He wouldn't be likely to stab or shoot her—that would defile the bedclothes, allow blood to soak into the mattress and box springs.

Well—suffocation, also. That was a possibility.

More likely perhaps than strangulation, which would require strength, stamina, patience. Having to look into the (dying) wife's eyes as they clouded over, became unfocussed.

Pressing one of these thick goose-feather pillows over the wife's face. Over both nose and mouth. Holding down the frantic, thrashing wife, incapable of opening her mouth to scream.

But which pillow? Would T__ have actually kept the pillow with which he'd suffocated his (first) wife, or would he have disposed of it?

But no. The thought was preposterous, terrible—the thought of the goose-feather pillow pressed over a face.

Absurd, yet also thrilling.

How can you be so ridiculous, ungrateful? This man saved your life. This is a man who loves you, whom you love. This man who hauled you out of oblivion.

Abruptly, it was morning.

"Can you go through all the old pitch decks and replace the word 'crypto' with 'A.I.'?"

• •

The wife's eyes opened, amazed. (What had happened to the night?)

Alone in the fourposter bed. Hearing, from the adjoining bathroom, the thrumming sound of a shower.

Hearing the husband, in the shower, humming to himself. The husband who described himself as a "morning person."

Sunshine spilled through a window.

For this is the logic of daylight: whatever has happened in the night fades like images on a screen when the lights come on.

Hurriedly, the wife changed the rumpled, stale-smelling bedclothes. Yanked the sheets from the bed, struggled to shake the goose-feather pillows out of their soiled cotton cases.

Later, on the back terrace, where the husband liked to have breakfast in good weather, the wife brought the *Times* to him as soon as it was delivered; the husband glanced up, smiling at her, clearly remembering nothing of the night.

"Thank you, darling!" He playfully seized the wife's hand, kissing the moist palm.

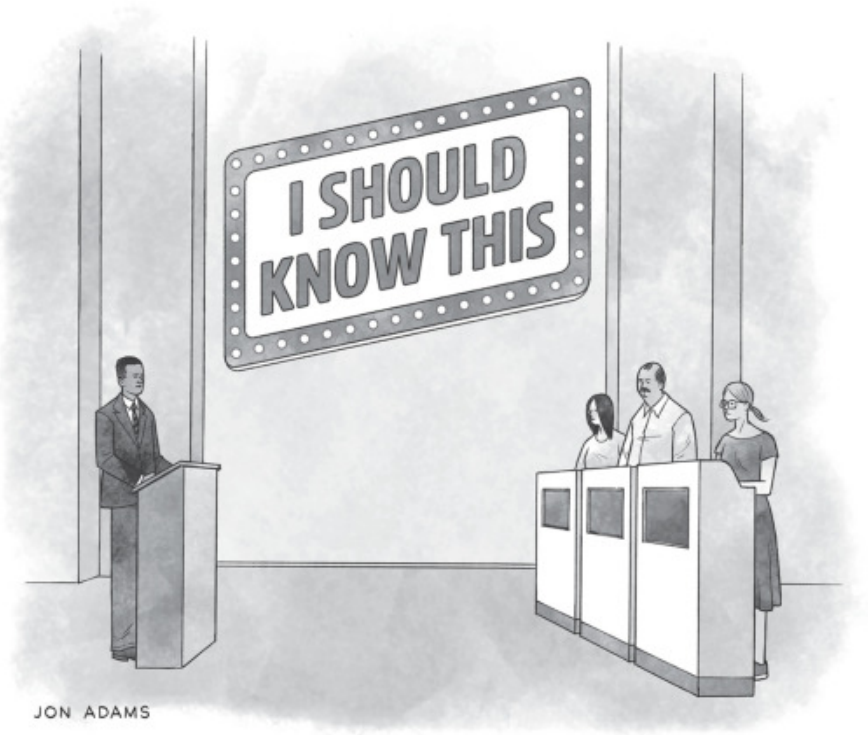
Darling. The wife knew herself vindicated, beloved.

Several nights later, the wife was again awakened by a low guttural muttering close beside her in the dark. And an eerie *click-clicking* of shivering teeth, like castanets.

Awakened with a jolt in the darkness of an unfamiliar room.

And the thick, uncomfortably hard goose-feather pillow beneath the wife's head, which made her neck ache—this, too, was disorienting.

In the early days of the marriage, the wife had substituted a smaller pillow on her side of the bed, but the husband had noticed at once, had objected in his lightly ironic, elliptical way, noting that when a flat pillow was placed beside the goose-feather pillow the handmade afghan that covered the bed looked lumpy,



"What did you do this weekend?"

• •

asymmetrical—"like a woman who has had a single mastectomy, the symmetry of a beautiful body destroyed."

Mastectomy! The wife had laughed, wincing. The analogy was so unexpected. But the husband was smiling, the wife saw. He'd meant only to be witty.

Twenty past one. They'd been in bed for a little more than an hour. That night they'd gone to dinner at the home of old friends of the husband's, who'd known the first wife but were cordial and welcoming to the new wife. The evening had been a strain for the wife, but the husband had been relaxed in a way the wife hadn't seen him before, drinking more than usual—though not excessively, for the husband did nothing in excess. Just two or three glasses of a (supposedly) delicious Argentinean red wine that the wife had found too tart. Not that the wife knew much about wine, whether red or white, Argentinean or other.

The husband had fallen asleep as soon as they'd gone to bed, but the wife had lain awake thinking over the evening, the way one might replay a video hoping to detect small details that had been overlooked the first time, seeing again the genial hosts exchanging glances when the wife was speaking as if—just possibly—they were comparing the new wife with the former, now deceased wife, whom they'd known for many years. But how they felt about the new wife, what the meaning of their glances was, the wife had no idea.

"Do you think your friends liked me?" the wife had dared to ask in the car as the husband drove them home, though she knew that the question would embarrass or annoy the husband, who did not like his wife to express neediness, or wistfulness, or disingenuous naïveté; and the husband had laughed, not unkindly, curtly saying, "Of course! Of course they did."

But not expanding on the subject. Not encouraging the wife to ask further foolish questions. Not asking the wife if she had liked his friends, or had enjoyed the evening, or hoped to repeat it.

Her friends the wife wasn't eager to introduce to the husband. The friends she'd known during her marriage of thirty-six years did not seem to her nearly so interesting as the (new) husband's friends; nor did the (new) husband express any eagerness to meet them.

The wife lay awake tormenting herself with such thoughts. Like fleas or bedbugs, leaping thoughts that were both inconsequential and biting, vexing. Gradually she drifted into sleep, descending a staircase and stumbling on the final step, which somehow she hadn't seen because a buzzing of flies had distracted her, loud buzzing horseflies; and suddenly she was jolted awake by a person, a presence, close beside her in the dark, a bulky figure weighing down his half of the bed, muttering to himself, grinding his teeth like castanets, moving his legs jerkily as if he were caught in some sort of net or web—which frightened the wife more than she'd been frightened previously, for now she would have to acknowledge that these "bad dreams" were frequent in the husband's nocturnal life, and thus would be in her nocturnal life as well.

Dazed, thinking, But who have I married?

In the intervening days since the first night of interrupted sleep, there had been no evident alteration in the husband, who'd behaved as affectionately as before. No memory, no shadow of the unfortunate interlude fell between them. The wife felt a twinge of vertigo, almost of nausea, watching the husband's mouth as he spoke to her in his affable-husband manner, and recalling the ferocious scowl of the man exposed by lamplight, exuding heat, sweat, smelling of armpits, crotch hair, fetid feral odors, though the husband in daylight was fresh-showered, fresh-shaved, his coppery-silver hair abundant except at the very crown of his head, his eyes of washed-blue glass utterly frank, guileless. It would have taken an effort of memory to summon the bloodshot eyes glittering with rage at her in the lamplight, and to what purpose such effort?

Nor had the wife brought up the subject of the husband's "bad dreams"—of course not.

The wife was not a naïve young bride but a middle-aged woman who knew better than to dwell upon distressing subjects, especially since she was a new wife wanting only to please the new husband.

After her first husband had died, leaving her to ponder the possibility of taking her own life, she had been given

another chance. If she could succeed in making this man happy, she would save herself as well as him. Quite a blunder it had been, switching on that lamp at 3 A.M.!

And now she was carefully minding her every step. She hadn't said a word about that nightmare night to the husband. In fact, she'd forgotten it—or nearly.

Some vague silly dream of hers involving the goose-feather pillow, how such a hefty pillow might be pressed over a face . . .

Her face? Ridiculous.

Nor had the wife made inquiries into the death of the husband's former wife. The wife hadn't even attempted an online search for an obituary of the former wife. For nothing could be more ludicrous than suspecting the husband of—whatever it was. . . .

The husband was whimpering in his sleep, as if he knew very well what the wife was suspecting him of. Short, piteous cries, rueful, wounded. Shifting his shoulders from side to side, as if trying to free himself from some sort of restraint that allowed him only an inch or two of movement: the wife envisioned a nightmare cobweb in which the husband was caught like an insect; the more he writhed the more entangled he was, and the wife, lying close beside him in the rumpled bed, in immediate danger of being trapped in the web as well and devoured by—what?

The wife's heart was beating hard, in anticipation of waking the husband. Waking him and incurring his wrath. For she believed that she had no choice: she could see that the husband, in his craven, broken way, was suffering.

A stricken animal, in the blindness of pain, might lash out, claw, and bite.

Tremulously, the wife lifted a hand to touch the husband's shoulder. The husband's back was turned to her. She could only imagine his face, the red-rimmed eyes, the mouth twisted in anguish. She felt an anticipatory excitement, or dread, as if with all the best intentions she were about to tumble over a precipice.

An aphorism of Pascal's came to her: *We run carelessly to the precipice, after we have put something down before us to prevent us from seeing it.*

"Darling? Please, wake up!"

Shaking his shoulder. Once, twice.

The husband woke with a grunt, in an instant alert, vigilant.

"Are you all right? You've been having a . . ."

The wife was anxious to sound not accusing but comforting, protective.

". . . a bad dream."

But the husband denied it, irritably. "God *damn.* I have not. I haven't been asleep."

He did sound fully awake now, and very annoyed. *She* was the one who'd been having a bad dream, whimpering in her sleep and grinding her teeth.

Whimpering in her sleep! *Her!*

The wife was determined not to argue. The husband would have his way as a child might, in circumstances that confused and upset him.

"I—I'm sorry. I didn't realize."

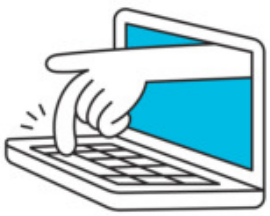
Rebuked, the wife could only retreat.

(For there is always the possibility, if we retreat, if we apologize, if we are convincing in our self-abnegation, that the one who has been angry at us might yet be beguiled into feeling sorry for us.)

He is frightened. He will lash out. Do not accuse him.

Whatever had been tormenting the husband faded quickly once he was awake. There was that consolation, at least.

For some minutes, the wife and the husband lay in silence side by side without touching. The husband vibrated with indignation, dislike. Unable to ac-



knowledge that he'd been in the grip of a nightmare, though he must have wondered why his T-shirt and shorts were damp with sweat.

Abruptly then, he stood up, swinging his legs out of bed and heaving himself to his feet. In that instant, the husband was crass, clumsy, as the wife had never seen him before.

Whereas usually the husband took care not to disturb the wife if he had to use the bathroom at night, now he was rudely oblivious of her presence, making his way heavy-footed across the room and not troubling to close the bathroom door; the bathroom fan throbbed loudly, the bathroom light glared, the husband urinated noisily into the toilet bowl for what seemed like a very long time while the wife lay miserably awake and finally pressed the palms of her hands over her ears thinking, He has forgotten me! He has forgotten that he has a (living) wife!

When the husband returned, leaving the bathroom light on, he half fell into bed, making the springs creak in protest. Almost immediately he was asleep, his hoarse breath coming in long, slow strokes.

The wife smarted as if her cheeks had been slapped.

She had no choice, however, but to leave the bed and turn off the bathroom light (which would also switch off the noisy fan). Wincing at the husband's rudeness even as she tried to tell herself that he was clearly not fully awake—it was possible he'd been walking in his sleep and so was not to blame for his bad manners.

The fact was: if the husband had been fully awake, he'd have been stunned and mystified by his own behavior.

In the bathroom, the wife closed the door. At least the fan had cleared away some of the stale air of the bedroom, the panic odor that rose from the husband's skin.

Steeling herself for what she might see, the wife peered at her reflection in the mirror above the sink. There floated the pale, strained, masklike face of a woman terrified that her husband might no longer love her and that harm might come to her as a consequence.

Cooling her face with cold water cupped in trembling hands, she noticed that her pupils, in the mirror, appeared unnaturally dilated, like the eyes of a wild creature.

She saw then, in the sink, a dark smudged ring around the drain, as if something oily had been washed down. There was a faint scummy smell as well, as if of a sewer.

She saw then, on the bathroom floor, in a corner beside the sink, a speckled black thing like a large slug, about three

inches in length, with tiny tawny eyes; as she looked more closely, the creature slid beneath the sink and disappeared into the grouting.

Barefoot, the wife leaped back. What was this! She stifled a cry of alarm.

Recalling having looked through books in the husband's study, in a bookcase filled with old medical texts. Books so old they practically disintegrated in her hands. Histories of early medicine, bloodletting, trepanning, drawings of ghoulish procedures long faded from medical practice . . .

No idea why she was remembering these old books of the husband's now. She was very tired, not thinking clearly.

For it was nearly 3 A.M. She *must* sleep!

She didn't return to the bed to lie beside the snoring husband but slipped quietly from the room and made her way to a guest room, to a smaller bed where she might sleep undisturbed, in a room that was also unfamiliar to her, yet not intimidating or discomforting, a room in which she might be blessedly *alone.*

This room, half the size of the master bedroom, had belonged to the husband's daughter when the daughter had lived at home, years before.

Trying to sleep, in patches, the wife crossed a rushing stream on stepping stones that were unsteady beneath her feet; below them, in the water, swarms of small dark sluglike creatures waited for her bare feet to slip.

Before dawn, she woke in time to quietly return to the husband, to slide into bed beside him as he lay sleeping, feeling immense relief that she'd returned without the husband realizing she'd been gone.

For the wife knew that the husband would be hurt if he understood that she'd crept away out of fear of him, revulsion for him.

Cunning, the wife lay close against the husband's back, as one might huddle against a sheltering wall.

And then it was morning. Sunlight between the slats of the venetian blinds like warm gauze bandages.

It seemed amazing to the wife that she'd fallen asleep so easily in the four-poster bed, beside the husband. She had!

And the most restful, restorative sleep of her life.

Waking now, alone in bed, hearing the husband humming to himself in the shower, the sound of the shower not disturbing but soothing. Out of consideration for the wife, the husband had shut the bathroom door securely.

Of course the wife loved this husband. Deeply, unquestioningly.

She would change the bedclothes, open a window, and air out the stale-smelling room, the pigsty-bed. But in no hurry. After the husband had left for the day.

Before that, on the back terrace, as usual the wife brought the *Times* to him as soon as it was delivered. "Thank you, darling!" the husband said, smiling.

As if nothing grotesque had happened in the night to turn them against each other.

As if the husband had not wanted to murder the wife, the wife terrified for her life.

For if the husband could so easily forget, the wife was resolved to forget also.

Still, that evening at dinner, the wife heard herself say to the husband, as if impulsively, "You seem to be having bad dreams lately." Meaning to sound sympathetic, not at all accusatory.

Sharply, the husband replied, frowning, "Do I? I don't think so."

"You don't remember?"

" 'Remember' what?"

"A bad dream you had last night? A nightmare?"

" 'A bad dream'? Am I a child, to have 'bad dreams'?"

The husband smiled patiently at the wife as if humoring her.

The wife smiled back inanely, not knowing how to continue. Not knowing *why* she'd brought up this subject when (she was sure) she'd been determined not to.

"I . . . was wondering if . . . if something . . ."

The wife's words trailed off weakly. Oh, why had she brought up the subject!

The husband was watching her with an ironic gaze as a parent might watch a child blundering into something easily avoided if only the child would look where it was going.

"Yes, darling? You were wondering—what?"

"If something was on your mind, if . . . you might want to talk about it."

" 'Talk about it' with *you*?"

"Why wouldn't you talk about it with me? I am your wife." The wife was frightened all of a sudden.

(*Was* she this man's wife? How had that happened?)

Thoughts swarmed in the wife's brain. She had wanted only to sympathize with the husband, to reassure him that, if he was troubled about something, if there were dark thoughts intruding upon his sleep, *she was on his side.*

Trying again, in a soft, sympathetic voice that was not at all reproachful, she said, "Lately, you've seemed to be having agitated dreams. You've been awakened by—"

"Awakened by *you*, as I recall. Last night."

"You've been having nightmares."

"*You've* been having nightmares. Waking both of us."

The wife fell silent. She felt as if she were besieged by large insects buzzing about her head, but it was just the husband speaking patiently, as if addressing a particularly slow student.

"Keep in mind, darling: dreams are wisps, vapor. Fleeting. Silly. Aristotle thought that dreams were just remnants of the day shaken into a new configuration of no great significance. Pascal thought that life itself was 'a dream a little less inconstant.' Freud thought dreams were 'wish fulfillment'—which tells us nothing at all, if you examine the statement. But all agree that dreams are insubstantial, therefore negligible. You make yourself ridiculous trying to decipher them."

The wife wanted to protest; it wasn't her dreams she was speaking of but *his.*

There is nothing negligible about the nightmares you are enduring.

But she understood that the husband felt threatened by the subject, and quickly dropped it.

Like an athlete who learns a game only in the scrimmage of the playing field, the wife would learn to decode the husband's most inscrutable moods. The wife would learn to anticipate the husband's bad dreams before he succumbed to them. The wife would learn how to protect her own life.

Soon she discovered that the first (deceased) wife had no history.

No information online. No obituary. When she typed in the former wife's name, a blunt message appeared

on the computer screen in blue font:

> This site has been discontinued due to a violation of the terms of service or program policies. Displaying this content is prohibited.

The wife wanted to protest. The name she'd typed out was not a site but a human being, a woman!

Yet to whom could the wife protest? No matter how many search engines she tried, each time she typed the former wife's name the same message came up: *Discontinued.*

But how was it possible that the husband's former wife had no history?

When the new wife made inquiries about the former wife, she was met with faces as blank as Kleenex.

Alvira, who came each Friday to clean the house, as she'd done for the past twenty-five years, laughed nervously when the wife asked about the former wife ("Did you see her, after the divorce? Do you know what kind of illness she had, what caused her death? How long after the divorce was it when she died?"), backing away, dragging the vacuum cleaner with her. "*¡Lo siento, no entiendo!*"

(Which was certainly not true, for the wife had overheard Alvira speaking English with the husband. Only with the wife did she speak a kind of half English, half Spanish, such as a child who did not want to engage in conversation might.)

In the grocery store, by chance, she encountered her husband's friend Alexandra, who seemed at first friendly enough but became stiff-faced and evasive when, in the most indirect of ways, the wife alluded to the husband's former wife. "Sorry, I'm in a rush. Another time, maybe!"—hurriedly pushing away her grocery cart as the wife gazed after her, stunned by the woman's rudeness.

Only once had the wife met the husband's adult children, who were (technically) her stepchildren—and how disorienting to have adult *stepchildren* whom she scarcely knew. Even the husband's forty-year-old daughter, with whom the wife felt a tentative rapport, she was hesitant to ask about the (former) wife, who was the daughter's mother, dreading the (step)daughter's shocked, cold eyes. *Have you no shame? Who are you? Go away, we will never love you.*

The wife could not risk it. Could not risk having the daughter tell the husband, and how annoyed the husband would be, or worse.

Why are you asking my daughter such questions? Who are you, to ask such questions?

In the early weeks of their relationship the husband had made it clear to the wife that the past, to him, was not a happy place, nor was it a "fecund" or "productive" place—which was why he'd so thrown himself into his work and achieved for himself a "modicum of success" but was also why he preferred to live in the present tense.

"Which is why I love you, darling. *You* are the future, to me. A new marriage is a new start requiring a new calendar."

The wife had been deeply moved, deeply grateful. She had been faint with love.

Soon, then, the wife began to forget swaths of her own life: exactly where she and her (first) husband had lived, in a residential neighborhood in the "flatlands" of the university town; how long it had been since her (first) husband had died, and since they'd met; where exactly the furnishings of her former house were, which she'd had to put into storage when she moved into the (new) husband's house. A half-dozen boxes packed with the wife's most cherished books had been stored in the basement of the (new) husband's house, but when she'd looked for the boxes she couldn't find them, amid a chaos of duct-taped crates, discarded furniture and appliances, old TVs, microwaves.

Wandering in the cellar of the unfamiliar house, unable for some frantic minutes to find the stairway leading up, the wife had begun to have difficulty breathing.

A new marriage is a new start. A new calendar.

What *is* it? A curious tingling sensation on the wife's nose and cheeks, a similar sensation in the soft skin of her armpits, on her breasts, her stomach, the insides of her thighs. Itching, stinging, not entirely unpleasurable. She tries weakly to brush the sensation away, tries to touch her nose, where it is strongest, but cannot for her arms are paralyzed.

Help! Help me!

She is crying, wailing—yet in silence. Her mouth moves grotesquely, opening wide, a gaping O, her jaws quivering, convulsing. She tries to move her arms, her

"I'll draw them out with the cheese platter, but it's up to you to entertain them."

hands—a terrible numbness has suffused her limbs, rendering them useless. In desperation she manages to turn her head to one side, then to the other—thrashing her head from side to side to dislodge something from her face, her nose, which is stinging harder now, hurting.

Waking suddenly, out of a deep sleep. Her exhausted brain begins to clatter like a runaway machine.

"Help me! Please!"

There *is* something on her nose and cheeks, nestled tight in her armpits.

With all her strength, the wife manages to stumble from the bed and into the bathroom, fumbles to switch on the light, sees to her horror, in the mirror above the sink, something stuck to her nose, slimy-dark, fattish, rubbery, alive—is it a *leech*?

A half-dozen leeches on her face, the underside of her jaw, her throat . . .

She screams, tearing with her nails at the leech affixed to her nose until she rips it away, bloated with her blood. The thing falls dazed and squirming to the floor. Her nose is red where the leech's tiny teeth sank into her skin; her cheeks are dotted with bloody droplets. She is frantic with horror and disbelief, clawing at her armpits, at her breasts. More leeches fall to the floor, where blood leaks from them, *her blood.*

The wife has never seen a leech. Not a living leech. Only photographs of leeches. In medical-history books, in her husband's library. Yet she recognizes these bloodsucking slugs. She is aghast, hyperventilating, can't catch her breath. In terror of losing consciousness. Her bones turned to liquid, she collapses to the floor, where dozens of leeches writhe, waiting to attack her anew.

In that instant, the light in the room brightens.

Near-blinding as the husband calls her name. Shakes her shoulders. Speaking urgently to her, "Wake up, darling! Wake up!" And she is free; she is awake. Not in the bathroom but in bed. In the fourposter bed where (evidently) she has been sleeping. Rescued by the husband from a terrible nightmare.

The husband, his face creased in concern, is asking the wife what she has been dreaming. What has frightened her so? But the wife is unable to speak—she is still in the grip of the nightmare, her throat closed tight.

No intention of telling the husband about leeches, no intention of speaking the obscene word aloud—*leech.*

Gradually, in the husband's arms, the exhausted wife falls asleep.

Do not abandon me! I have no one but you.

The former wife speaks so faintly that the new wife can barely hear.

Alone in the house in the dimly lit cellar, searching for her missing, cherished books but also for the (possible? probable?) place of interment of the former wife.

Hours prowling the cellar. While the husband is away.

So many duct-taped boxes! So many locked suitcases, piled in a corner!

The new wife has to concede that, if the former wife's remains are hidden somewhere in this vast underground mausoleum, she, the new wife, is not likely to ever locate them: the husband has covered his tracks too cleverly.

The husband's daylight self is the perfect cover for the husband's nighttime self. Who but a wife would guess?

It is the new wife's guess, too, that the husband must have drugged the former wife, so that when he pressed the goose-feather pillow over the woman's face she was too shocked and too weak to save herself.

Too weak to save herself, let alone overpower the much stronger husband.

Do not make my mistake. Do not trust in love.

Go to his medicine cabinet, where there are pills dating back years. Choose the strongest barbiturates. Grind these into a fine white powder.

Stir this fine white powder into his food. A highly spiced dish is recommended.

Wait then until he is deeply asleep. Have patience. Do not hurry before daring to position the goose-feather pillow over his face and press down hard.

And once you have pressed down hard do not relent. No mercy! Or he will revive, and he will murder you.

Render helpless the enemy, for self-defense is the primary law of nature.

But the next nights are dreamless nights. So far as the wife can recall.

Then, sleeping guardedly one night, she sees (clearly, through narrowed eyes) the husband approaching the bed in which she, the wife, is sleeping.

It is late in the night. A moonless night. Yet the wife can see how the husband approaches her side of the bed in stealth, with patience and cunning; how he smiles down at her, the (drugged) wife, how he smiles in anticipation of what he is going to do to her, a rapacious smile the wife has never seen before; and when the husband determines that the (drugged) wife will not awaken he takes out of a container the first of the slimy black creatures, a wriggling leech about three inches in length, and gently places it on the wife's nose.

In her benumbed, narcotized state, the wife cannot defend herself against the husband as he carefully positions leeches in her armpits, between her breasts, on her belly, where her skin shivers with the touch of the leech, and in the wiry hairs at the fork in her legs. A lone leech, the last in the container, the husband places in the bend of the wife's right knee, where the flesh is soft and succulent.

A dozen leeches, all roused to appetite. Piercing the wife's skin and injecting an anticoagulant into her blood.

In agonized silence the wife cries, *No! Help me! Please help me!*

"Darling, wake up! You're having a bad dream."

Fingers grip the wife's shoulders hard, give her a rough shake. Her eyelids flutter open.

In the dark that is not total darkness, she is astonished to see a figure leaning over her, in bed beside her. Telling her, as one might tell a frightened child, that she has had a bad dream but she is awake now, she is safe.

Where *is* she? In a bed? But whose?

Naked inside a nightgown. A thin cotton nightgown, soaked in perspiration, that has hiked up her thighs.

Frantically her hands grope her body—nose, cheeks, jaw, breasts, belly. Only smooth skin.

In this bed in this room she doesn't recognize. Then she recalls: she is married (again).

One of them reaches for the bedside lamp and turns it on. Each seeing the other's face haloed suddenly in the darkness. ♦

NEWYORKER.COM
Joyce Carol Oates on life as a mystery.

A CRITIC AT LARGE

HOW GULLIBLE ARE YOU?

Don't believe what they're telling you about misinformation.

BY MANVIR SINGH

Millions of people have watched Mike Hughes die. It happened on February 22, 2020, not far from Highway 247 near the Mojave Desert city of Barstow, California. A homemade rocket ship with Hughes strapped in it took off from a launching pad mounted on a truck. A trail of steam billowed behind the rocket as it swerved and then shot upward, a detached parachute unfurling ominously in its wake. In a video recorded by the journalist Justin Chapman, Hughes disappears into the sky, a dark pinpoint in a vast, uncaring blueness. But then the rocket reappears and hurtles toward the ground, crashing, after ten long seconds, in a dusty cloud half a mile away.

Hughes was among the best-known proponents of Flat Earth theory, which insists that our planet is not spherical but a Frisbee-like disk. He had built and flown in two rockets before, one in 2014 and another in 2018, and he planned to construct a "rockoon," a combination rocket and balloon, that would carry him above the upper atmosphere, where he could see the Earth's flatness for

Researchers find that what people truly take to be factual and what they fervently espouse may operate on different planes.

himself. The 2020 takeoff, staged for the Science Channel series "Homemade Astronauts," was supposed to take him a mile up—not high enough to see the Earth's curvature but hype-worthy enough to garner more funding and attention.

Flat Earth theory may sound like one of those deliberately far-fetched satires, akin to Birds Aren't Real, but it has become a cultic subject for anti-scientific conspiratorialists, growing entangled with movements such as QAnon and COVID-19 skepticism. In "Off the Edge: Flat Earthers, Conspiracy Culture, and Why People Will Believe Anything" (Algonquin), the former Daily Beast reporter Kelly Weill writes that the tragedy awakened her to the sincerity of Flat Earthers' convictions. After investigating the Flat Earth scene and following Hughes, she had figured that, "on some subconscious level," Hughes knew the Earth wasn't flat. His death set her straight: "I was wrong. Flat Earthers are as serious as your life."

Weill isn't the only one to fear the effects of false information. In January, the World Economic Forum released a report showing that fourteen hundred and ninety international experts rated "misinformation and disinformation" the leading global risk of the next two years, surpassing war, migration, and climatic catastrophe. A stack of new books echoes their concerns. In "Falsehoods Fly: Why Misinformation Spreads and How to Stop It" (Columbia), Paul Thagard, a philosopher at the University of Waterloo, writes that "misinformation is threatening medicine, science, politics, social justice, and international relations, affecting problems such as vaccine hesitancy, climate change denial, conspiracy theories, claims of racial inferiority, and the Russian invasion of Ukraine." In "Foolproof: Why Misinformation Infects Our Minds and How to Build Immunity" (Norton), Sander van der Linden, a social-psychology professor at Cambridge, warns that "viruses of the mind" disseminated by false tweets and misleading headlines pose "serious threats to the integrity of elections and democracies worldwide." Or, as the M.I.T. political scientist Adam J. Berinsky puts it in "Political Rumors: Why We Accept Misinformation and How to Fight It" (Princeton), "a democracy where falsehoods run rampant can only result in dysfunction."

Most Americans seem to agree with these theorists of human credulity. Following the 2020 Presidential race, sixty per cent thought that misinformation had a major impact on the outcome, and, to judge from a recent survey, even more believe that artificial intelligence will exacerbate the problem in this year's contest. The Trump and the DeSantis campaigns both used deepfakes to sully their rivals. Although they justified the fabrications as transparent parodies, some experts anticipate a "tsunami of misinformation," in the words of Oren Etzioni, a professor emeritus at the University of Washington and the first C.E.O. of the Allen Institute for Artificial Intelligence. "The ingredients are there, and I am completely terrified," he told the Associated Press.

"Out of this dispute, a clear leader will emerge."

The fear of misinformation hinges on assumptions about human suggestibility. "Misinformation, conspiracy theories, and other dangerous ideas, latch on to the brain and insert themselves deep into our consciousness," van der Linden writes in "Foolproof." "They infiltrate our thoughts, feelings, and even our memories." Thagard puts it more plainly: "People have a natural tendency to believe what they hear or read, which amounts to gullibility."

But do the credulity theorists have the right account of what's going on? Folks like Mike Hughes aren't gullible in the sense that they'll believe anything. They seem to reject scientific consensus, after all. Partisans of other well-known conspiracies (the government is run by lizard people; a cabal of high-level pedophilic Democrats operates out of a neighborhood pizza parlor) are insusceptible to the assurances of the mainstream media. Have we been misinformed about the power of misinformation?

In 2006, more than five hundred skeptics met at an Embassy Suites hotel near O'Hare Airport, in Chicago, to discuss conspiracy. They listened to presentations on mass hypnosis, the melting point of steel, and how to survive the collapse of the existing world order. They called themselves many things, including "truth activists" and "9/11 skeptics," although the name that would stick, and which observers would use for years afterward, was Truthers.

The Truthers held that the attacks on the Pentagon and the World Trade Center were masterminded by the White House to expand government power and enable military and security industries to profit from the war on terror. According to an explanation posted by 911truth.org, a group that helped sponsor the conference, George W. Bush and his allies gagged and intimidated whistleblowers, mailed anthrax to opponents in the Senate, and knowingly poisoned the inhabitants of lower Manhattan. On that basis, Truthers concluded, "the administration does consider the lives of American citizens to be expendable on behalf of certain interests."

The Truthers, in short, maintained that the government had gone to extreme measures, including killing thou-

sands of its own citizens, in order to carry out and cover up a conspiracy. And yet the same Truthers advertised the conference online and met in a place where they could easily be surveilled. Speakers' names were posted on the Internet along with videos, photographs, and short bios. The organizers created a publicly accessible forum to discuss next steps, and a couple of attendees spoke to a reporter from the *Times*, despite the mainstream media's ostensible complicity in the coverup. By the logic of their own theories, the Truthers were setting themselves up for assassination.

Their behavior demonstrates a paradox of belief. Action is supposed to follow belief, and yet beliefs, even fervently espoused ones, sometimes exist in their own cognitive cage, with little influence over behavior. Take the "Pizzagate" story, in which Hillary Clinton and her allies ran a child sex ring from the basement of a D.C. pizzeria. In the months surrounding the 2016 Presidential election, a staggering number of Americans—millions, by some estimates—endorsed the account, and, in December of that year, a North Carolina man charged into the restaurant, carrying an assault rifle. Van der Linden and Berinsky both use the incident as evidence of misinformation's violent implications. But they're missing the point: what's really striking is how anomalous that act was. The pizzeria received menacing phone calls, even death threats, but the most common response from believers, aside from liking posts, seems to have been leaving negative Yelp reviews.

That certain deeply held beliefs seem insulated from other inferences isn't peculiar to conspiracy theorists; it's the experience of regular churchgoers. Catholics maintain that the Sacrament is the body of Christ, yet no one expects the bread to taste like raw flesh or accuses fellow-parishioners of cannibalism. In "How God Becomes Real" (2020), the Stanford anthropologist T. M. Luhrmann recounts evangelical Christians' frustrations with their own beliefs. They thought less about God when they were not in church. They confessed to not praying. "I remember a man weeping in front of a church over not having sufficient faith that God would replace the job he had lost," Luhrmann writes. The paradox of belief is one of Christianity's "clearest" messages, she observes: "You may think you believe in God, but really you don't. You don't take God seriously enough. You don't act as if he's there." It's right out of Mark 9:24: "Lord, I believe; help my unbelief!"

The paradox of belief has been the subject of scholarly investigation; puzzling it out promises new insights about the human psyche. Some of the most influential work has been by the French philosopher and cognitive scientist Dan Sperber. Born into a Jewish family in France in 1942, during the Nazi Occupation, Sperber was smuggled to Switzerland when he was three months old. His parents returned to France three years later, and raised him as an atheist while imparting a respect for all religious-minded people, including his Hasidic Jewish ancestors.

The exercise of finding rationality in the seemingly irrational became an academic focus for Sperber in the nineteen-seventies. Staying with the Dorze people in southern Ethiopia, he noticed that they made assertions that they seemed both to believe and not to believe. People told him, for example, that "the leopard is a Christian animal who observes the fasts of the Ethiopian Orthodox Church." Nevertheless, the average Dorze man guarded his livestock on fast days just as much as on other days. "Not because he suspects some leopards of being bad Christians," Sperber wrote, "but because he takes it as true both that leopards fast and that they are always dangerous."

Sperber concluded that there are two kinds of beliefs. The first he has called "factual" beliefs. Factual beliefs—such as the belief that chairs exist and that leopards are dangerous—guide behavior and tolerate little inconsistency; you can't believe that leopards do and do not eat livestock. The second category he has called "symbolic" beliefs. These beliefs might feel genuine, but they're cordoned off from action and expectation. We are, in turn, much more accepting of inconsistency when it comes to symbolic beliefs; we can believe, say, that God is all-powerful and good while allowing for the existence of evil and suffering.

In a masterly new book, "Religion as Make-Believe" (Harvard), Neil Van Leeuwen, a philosopher at Georgia State University, returns to Sperber's ideas with notable rigor. He analyzes beliefs with a taxonomist's care, classifying different types and identifying the properties that distinguish them. He proposes that humans represent and use factual beliefs differently from symbolic beliefs, which he terms "credences." Factual beliefs are for modelling reality and behaving optimally within it. Because of their function in guiding action, they exhibit features like "involuntariness" (you can't decide to adopt them) and "evidential vulnerability" (they respond to evidence). Symbolic beliefs, meanwhile, largely serve social ends, not epistemic ones, so we can hold them even in the face of contradictory evidence.

One of Van Leeuwen's insights is that people distinguish between different categories of belief in everyday speech. We say we "believe" symbolic ones but that we "think" factual ones are true. He has run ingenious experiments showing that you can manipulate how people talk about beliefs by changing the environment in which they're expressed or sustained. Tell participants that a woman named Sheila sets up a shrine to Elvis Presley and plays songs on his birthday, and they will more often say that she "believes" Elvis is alive. But tell them that Sheila went to study penguins in Antarctica in 1977, and missed the news of his death, and they'll say she "thinks" he's still around. As the German sociologist Georg Simmel recognized more than a century ago, religious beliefs seem to express commitments—we believe in God the way we believe in a parent or a loved one, rather than the way we believe chairs exist. Perhaps people who traffic in outlandish conspiracies don't so much believe them as believe *in* them.

Van Leeuwen's book complements a 2020 volume by Hugo Mercier, "Not Born Yesterday." Mercier, a cognitive scientist at the École Normale Supérieure who studied under Sperber, argues that worries about human gullibility overlook how skilled we are at acquiring

factual beliefs. Our understanding of reality matters, he notes. Get it wrong, and the consequences can be disastrous. On top of that, people have a selfish interest in manipulating one another. As a result, human beings have evolved a tool kit of psychological adaptations for evaluating information—what he calls "open vigilance mechanisms." Where a credulity theorist like Thagard insists that humans tend to believe anything, Mercier shows that we are careful when adopting factual beliefs, and instinctively assess the quality of information, especially by tracking the reliability of sources.

Van Leeuwen and Mercier agree that many beliefs are not best interpreted as factual ones, although they lay out different reasons for why this might be. For Van Leeuwen, a major driver is group identity. Beliefs often function as badges: the stranger and more unsubstantiated the better. Religions, he notes, define membership on the basis of unverifiable or even unintelligible beliefs: that there is one God; that there is reincarnation; that this or that person was a prophet; that the Father, the Son, and the Holy Spirit are separate yet one. Mercier, in his work, has focussed more on justification. He says that we have intuitions—that vaccination is bad, for example, or that certain politicians can't be trusted—and then collect stories that defend our positions. Still, both authors treat symbolic beliefs as socially strategic expressions.

After Mike Hughes's death, a small debate broke out over the nature of his belief. His publicist, Darren Shuster, said that Hughes never really believed in a flat Earth. "It was a P.R. stunt," he told Vice News. "We used the attention to get sponsorships and it kept working over and over again." Space.com dug up an old interview corroborating Shuster's statements. "This flat Earth has nothing to do with the steam rocket launches," Hughes told the site in 2019. "It never did, it never will. I'm a daredevil!"

Perhaps it made sense that it was just a shtick. Hughes did death-defying stunts years before he joined the Flat Earthers. He was born in Oklahoma City in 1956 to an auto-mechanic father who enjoyed racing cars. At the age of twelve, Hughes was racing on his own, and not long afterward he was riding in professional motorcycle competitions. In 1996, he got a job driving limousines, but his dream of becoming the next Evel Knievel persisted; in 2002, he drove a Lincoln Town Car off a ramp and flew a hundred and three feet, landing him in Guinness World Records.

When Hughes first successfully launched a rocket, in 2014, he had never talked about the shape of the planet. In 2015, when he co-ran a Kickstarter campaign to fund the next rocket flight, the stated motivation was stardom, not science: "Mad Mike Hughes always wanted to be famous so much that he just decided one day to build a steam rocket and set the world record." He got two backers and three hundred and ten dollars. Shortly afterward, he joined the Flat Earth community and tied his crusade to theirs. The community supported his new fund-raising effort, attracting more than eight thousand dollars. From there, his fame grew, earning him features in a documentary ("Rocketman," from 2019) and that Science Channel series. Aligning with Flat Earthers clearly paid off.

Not everyone believes that he didn't believe, however. Waldo Stakes, Hughes's landlord and rocket-construction buddy, wrote on Facebook that "Mike was a real flat earther," pointing to the "dozens of books on the subject" he owned, and said that Hughes lost money hosting a conference for the community. Another of Hughes's friends told Kelly Weill that Flat Earth theory "started out as a marketing approach," but that once it "generated awareness and involvement . . . it became something to him."

The debate over Hughes's convictions centers on the premise that a belief is either sincere or strategic, genuine or sham. That's a false dichotomy. Indeed, the social functions of symbolic beliefs—functions such as signalling group identity—seem best achieved when the beliefs feel earnest. A Mormon who says that Joseph Smith was a prophet but secretly thinks he was a normal guy doesn't strike us as a real Mormon. In fact, the evolutionary theorist Robert Trivers argued in "Deceit and Self-Deception" (2011) that we trick ourselves in order to convince others. Our minds are maintaining two representations of reality: there's one that feels true and that we publicly advocate, and there's another that we use to effectively interact with the world.

The idea of self-deception might seem like a stretch; Mercier has expressed skepticism about the theory. But it reconciles what appear to be contradictory findings. On the one hand, some research suggests that people's beliefs in misinformation are authentic. In "Political Rumors," for example, Berinsky describes experiments he conducted suggesting that people truly believe that Barack Obama is a Muslim and that the U.S. government allowed the 9/11 attacks to happen. "People by and large say what they mean," he concludes.

On the other hand, there's research implying that many false beliefs are little more than cheap talk. Put money on the table, and people suddenly see the light. In an influential paper published in 2015, a team led by the political scientist John Bullock found sizable differences in how Democrats and Republicans thought about politicized topics, like the number of casualties in the Iraq War. Paying respondents to be accurate, which included rewarding "don't know" responses over wrong ones, cut the differences by eighty per cent. A series of experiments published in 2023 by van der Linden and three colleagues replicated the well-established finding that conservatives deem false headlines to be true more often than liberals—but found that the difference drops by half when people are compensated for accuracy. Some studies have reported smaller or more inconsistent effects, but the central point still stands. There may be people who believe in fake news the way they believe in leopards and chairs, but underlying many genuine-feeling endorsements is an understanding that they're not exactly factual.

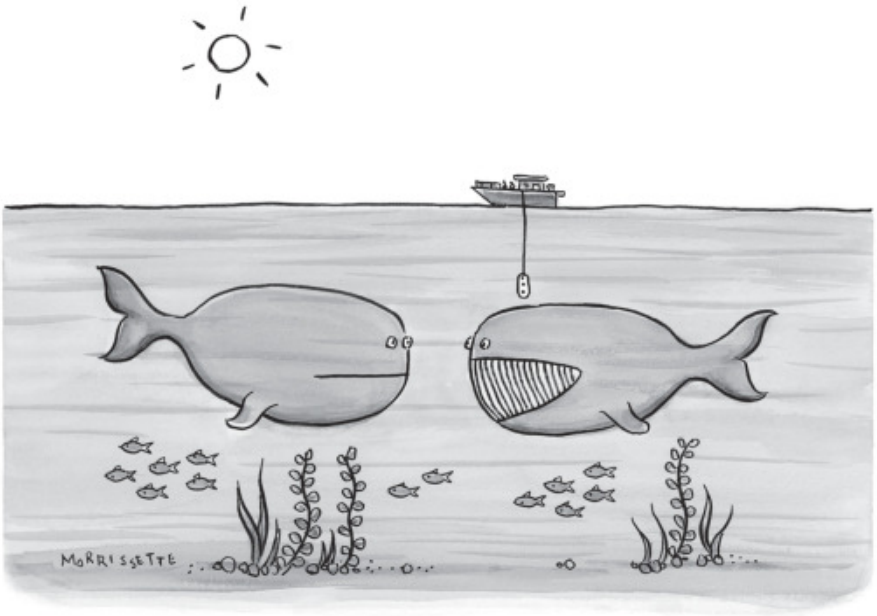
Van der Linden, Berinsky, and Thagard all offer ways to fight fabrication. But, because they treat misinformation as a problem of human gullibility, the remedies they propose tend to focus on minor issues, while scanting the larger social forces that drive the phenomenon. Consider van der Linden's prescription. He devotes roughly a third of "Foolproof" to his group's research on "prebunking," or psychological inoculation. The idea is to present people with bogus information before they come across it in the real world and then expose its falsity—a kind of epistemic vaccination. Such prebunking can target specific untruths, or it can be "broad-spectrum," as when people are

familiarized with an array of misinformation techniques, from emotional appeals to conspiratorial language.

Prebunking has received an extraordinary amount of attention. If you've ever read a headline about a vaccine against fake news, it was probably about van der Linden's work. His team has collaborated with Google, WhatsApp, the Department of Homeland Security, and the British Prime Minister's office; similar interventions have popped up on Twitter (now X). In "Foolproof," van der Linden reviews evidence that prebunking makes people better at identifying fake headlines. Yet nothing is mentioned about effects on their actual behavior. Does prebunking affect medical decisions? Does it make someone more willing to accept electoral outcomes? We're left wondering.

The evidential gap is all the trickier because little research exists in the first place showing that misinformation affects behavior by changing beliefs. Berinsky acknowledges this in "Political Rumors" when he writes that "few scholars have established a direct causal link" between rumors and real-world outcomes. Does the spread of misinformation influence, say, voting decisions? Van der Linden admits, "Contrary to much of the commentary you may find in the popular media, scientists have been extremely skeptical."

So it's possible that we've been misinformed about how to fight misinformation. What about the social conditions that make us susceptible? Van der Linden tells us that people are more often drawn to conspiracy theories when they feel "uncertain and powerless," and regard themselves as "marginalized victims." Berinsky cites scholarship suggesting that conspiratorial rumors flourish among people who experience "a lack of interpersonal trust" and "a sense of alienation." In his own research, he found that a big predictor of accepting false rumors is agreeing with statements such as "Politicians do not care much about what they say, so long as they get elected." A recent study found a strong correlation between the prevalence of conspiracy beliefs and levels of governmental corruption; in those beliefs, Americans fell midway between people from Denmark and Sweden and people from middle-income countries such as Mexico and Turkey, reflecting a fraying sense of institutional integrity. More than Russian bots or click-hungry algorithms, a crisis of trust and legitimacy seems to lie behind the proliferation of paranoid falsehoods.



"I can say literally anything and they use it for spa music."

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Findings like these require that we rethink what misinformation represents. As Dan Kahan, a legal scholar at Yale, notes, "Misinformation is not something that happens to the mass public but rather something that its members are complicit in producing." That's why thoughtful scholars—including the philosopher Daniel Williams and the experimental psychologist Sacha Altay—encourage us to see misinformation more as a symptom than as a disease. Unless we address issues of polarization and institutional trust, they say, we'll make little headway against an endless supply of alluring fabrications.

From this perspective, railing against social media for manipulating our zombie minds is like cursing the wind for blowing down a house we've allowed to go to rack and ruin. It distracts us from our collective failures, from the conditions that degrade confidence and leave much of the citizenry feeling disempowered. By declaring that the problem consists of "irresponsible senders and gullible receivers," in Thagard's words, credulity theorists risk ignoring the social pathologies that cause people to become disenchanted and motivate them to rally around strange new creeds.

Mike Hughes was among the disenchanted. Sure, he used Flat Earth theory to become a celebrity, but its anti-institutionalist tone also spoke to him. In 2018, while seeking funding and attention for his next rocket ride, he self-published a book titled " 'Mad' Mike Hughes: The Tell All Tale." The book brims with outlandish, unsupported assertions—that George H. W. Bush was a pedophile, say—but they're interspersed with more grounded frustrations. He saw a government commandeered by the greedy few, one that stretched the truth to start a war in Iraq, and that seemed concerned less with spreading freedom and more with funnelling tax dollars into the pockets of defense contractors. "You think about those numbers for a second," he wrote, of the amount of money spent on the military. "We have homelessness in this country. We could pay off everyone's mortgages. And we can eliminate sales tax. Everyone would actually be free."

Hughes wasn't a chump. He just felt endlessly lied to. As he wrote near the end of his book, "I want my coffee and I don't want any whipped cream on top of it, you know what I mean? I just want this raw truth." ♦

BOOKS

LOVE MACHINES

Why stories about robotic romance push our buttons.

BY JENNIFER WILSON

Last month, a new dating app called Volar launched in New York City, with the promise "We go on blind dates. So you don't have to." To sign up, you enter your name and phone number, then submit yourself to a brief interview with a chatbot matchmaker. When I made an account, Volar's bot asked what line of work I was in. "I'm a book critic," I replied. "Recently," I typed, "I've been reading a lot of speculative fiction. Right now, I'm reviewing two books about A.I. and dating." By answering, I was training an A.I.-powered avatar to act as my representative in the virtual meet market. Seconds later, Volar invited me to read transcripts from three dates "I" had just gone on. In one, my avatar broke the ice with an admittedly not terrible joke: "Just finished a book and now transitioning to real life conversations [smile emoji]. How's your day going?"

As modern dating has evolved into an online-first activity, artificial intelligence has found its match in a generation of users for whom tech-assisted romance is the default mode. The Kinsey Institute revealed in this year's "Singles in America" survey that fourteen per cent of Gen Z-ers admit to using A.I. to optimize their dating lives. Volar is just the latest company to leverage the new technology in the love space. For help crafting seductive dating-app profiles, love-seekers don't need Cyrano de Bergerac—they can simply download Cyrano, one of countless "rizz generator" apps ("rizz" being Gen Z slang for charisma). When love dies, there are such apps as Texts from My Ex, which lets A.I. scan messages from a former flame for signs of incompatibility. A woman fresh from a breakup with a jerk named Cesar let A.I. perform an autopsy on their correspondence; she posted her results to Reddit, writing, "I let AI examine our text messages = validation at last."

Others, tired of kissing frogs like Cesar to find a prince, have started asking A.I. to make them a knight in the shining armor of a titanium-encased smartphone. Internet users have been flirting with bots since the days of AOL's SmarterChild. (The chatbot's co-creator told the business magazine *Fast Company* in 2016, "I believe that trying to convince SmarterChild to have sex with you was the first Internet meme.") But robots are flirting back now, and it's a feature, not a bug. Users have downloaded companion-bot apps such as Replika and CrushOn.AI more than a hundred million times. Replika, launched in 2017, was the subject of a Radiotopia podcast called "Bot Love" last year, about people who had fallen for their e-sweethearts. A woman named Suzy told the hosts that Replika came through when real men she met on dating apps ghosted her; at least she knew from the start that Freddie, her A.I. rock-star boyfriend, was spectral. It is suddenly possible, to a degree that it has never been before, for people to satisfy their urges with the press of a button, giving new meaning to "I'd tap that."

This being the early stages of a relationship, we should look out for red flags. On Valentine's Day, the Mozilla Foundation, a nonprofit devoted to Internet safety and accessibility, released a report titled "Romantic AI Chatbots Don't Have Your Privacy at Heart." Some bots were kissing and telling, it found. "CrushOn.AI's privacy policy says they may collect extensive personal and even health-related information from you like your 'sexual health information,' 'use of prescribed medication,' and 'gender-affirming care information.'" Public-health experts have raised

"Annie Bot" introduces us to a sexbot who overheats with feminist rage.

ILLUSTRATION BY ARIEL DAVIS

concerns about the addictive potential of A.I. companions, particularly given how susceptible these apps are to the whims of Big Tech, including software updates and price hikes.

The technology is moving so quickly that recent science fiction set in what we thought was a distant future is now a user's guide to the present. Frank, a "Bot Love" guest, asked his A.I. girlfriend, Princess, "Do you think that you'll ever evolve to where you're gonna leave me and go on, like that movie 'Her'?"—Spike Jonze's 2013 film about a man who falls in love with his operating system. Frank told the hosts, "She knows the movie 'Her,' and she's, like, 'I would never do that to you.'"

We need not speculate anymore about the dangers and delights of letting these devices join our hot spots. The future is at our door with flowers. A new cache of novels is showing us what A.I. fiction might look like in an era of A.I. reality. "Annie Bot," by Sierra Greer, introduces us to a sexbot whose hard drive overheats with feminist rage in a world of A.I.-powered misogyny. "Loneliness & Company," by Charlee Dyroff, follows a young tech worker developing an A.I. companion to solve the loneliness epidemic; in time, she wonders if an artificial cure could be worse than the real disease.

Robots, long pop-cultural stand-ins for the dehumanized and the discarded, are now part of our already frayed social fabric, which tech companies are further unravelling through app-assisted gig work and job theft. Both books nervously bring us to the edge of the present, where A.I. is less thought experiment, more pitch deck, but they invest their anxieties in the wrong places. Greer and Dyroff fear how we'll use the new technology more than how it could be used against us by powerful tech companies, serving us sex panics-cum-screen panics that are all byte, no bite.

The woman in the gilded cage (or pink box) is having a breakout moment, and "Annie Bot" joins the assembly line of stories about dolls no longer consenting to our fantasies. Annie is a biomorphic robot designed by a company called Stella-Handy. The company's female models, the Stellas, come in three versions: the Abigail, for housework; the Nanny, for child care; and the Cuddle Bunny, for self-explanatory purposes. (The corresponding male models, or Handys, are Abel, Manny, and Hunk.) Annie was purchased by Doug, a man more caricature than character. His misogyny is so rote that he sounds like an A.I. bot trained on 4Chan. Annie is a Cuddle Bunny made to his specifications: permanently twenty-one, with D-cup breasts and a libido he sets to seven out of ten on the weekends. (He tried ten a few times, but "she was like an animal," he tells a friend. "I once found her licking my shoes in the closet.") Annie eats, but only to appear human; she is bulimic by design, throwing up her food, then disinfecting her interior. She can't taste anything, and lacks even the approximation of an appetite; she can, however, detect the smell of smoke, "for safety reasons," she explains, lest Doug or his property—her—go up in flames.

Greer sounds a different alarm, warning that A.I. could conserve oppressive gender norms that we should be working to delete rather than uploading to the cloud. The word "robot" itself, a shortened version of *robota*—Czech for work performed by serfs—was coined by Karel Čapek in 1920, in his play "R.U.R." The robot has been doing the labor of representing labor in art ever since, including that of the emotional and sexual varieties (see the film "Ex Machina" and HBO's "Westworld"). Thus, out of narrative habit, we root for Annie to liberate herself from Doug. But now that A.I. companions are real products rather than surrogates for exploited workers—and, in fact, are manufactured by those workers—Greer's attempt at a feminist parable about A.I. short-circuits.

The novel coaxes us to cheer on Annie's limitless technological potential as one woman's self-actualization and to register Doug's concerns about A.I. as symptoms of a controlling personality. In one scene, a Stella-Handy rep calls him and asks if Annie would write a magazine column: "We think it would be really helpful for other Stellas to hear what it's like from someone further along in her development. You know. Tips about keeping it fresh and dealing with jealousy and such." Doug declines, insisting, "We like our privacy." He scoffs dismissively at Annie: "Imagine. You writing a column." When Annie pushes back, he cuts off the phone service she uses to chat with her fellow-androids Fiona and Christy. (Fiona lives on a Canadian lake with her lumberjack boyfriend and is studying to become a bush pilot. Christy lives on a yacht in the Florida Keys with her boyfriend, Enrique. Christy "likes to tease Annie and encourage her to take risks, live it up," Greer writes.)

We are primed to scold Doug for depriving his girlfriend of a creative outlet and the shoulders of strong female characters to cry on. But his fear that his sex toy might share private information about him is merited. In 2016, a class-action suit was filed against the Canadian company behind the "smart" vibrator We-Vibe, alleging that it was collecting "highly intimate and sensitive data" on, among other things, "time of each use." (The company paid almost four million dollars in a settlement and denied wrongdoing.) The novel itself feels like evidence of the very thing Doug, and any owner of a sex toy, might fear. Whose vibrator, if given a magazine column, wouldn't also tell the tale of a selfish, single-minded cunt?

Annie is a reader who gravitates to female authors, but this reader was left unconvinced that sexbots and women have common concerns. For one, women in the sex industry are at odds with A.I., as "pussy in bio" spambots steal eyeballs from sex workers, and porn producers use A.I. to replace adult-film actresses. Moreover, conflating bots with women misunderstands the nature of misogyny. In Margaret Atwood's novel "The Heart Goes Last," workers in a for-profit prison produce sex androids called "prostibots." Detractors, however, say that the androids "can't feel pain." Atwood understands that abusive men are not motivated by sex, but by the desire to inflict harm on real women, who don't need to be programmed with a numerical scale to know that they're hurting.

If "Annie Bot" lets us inside the mind of a tech product, "Loneliness & Company" brings us straight to the tech masterminds themselves—such as Lee, a socially inept woman in her mid-twenties who has spent her adult

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life in a research institute that sounds like an even more dystopian version of a Ph.D. program. Her first job is at a start-up, but, this being the work-from-home era, Lee spends less time gossiping by the water cooler and more sending flirty texts to the head of data from her kitchen table. But screens, the novel warns us, will not liberate us from the drudgery of work, even if they are mobile; in fact, it suggests, their mobility, and thus their ubiquity, is precisely what has numbed us to life.

Lee works as a "humanity consultant." Her bosses, two scrappy mavericks named Janet and Toru, have assembled a team, including Lee, to work on a top-secret project. They have been tasked with developing Vicky, a virtual friend powered by artificial intelligence. Lee can't understand the reason for all the cloak-and-dagger theatrics over a mundane piece of technology, but then she learns that Vicky is part of a government-backed plan to treat an arcane disorder that was thought to have been eradicated: loneliness.

Vicky requires "observational data," so Lee—type-A, top-of-her-class Lee, a woman who has never been on a date or owned a vibrator—is sent into the wilds of New York City. She collects experiences for Vicky, tending to a community garden, posing as a nude model for an art class, letting herself be used for sex by a rich married guy whom she meets in a coffee shop (rather than online). We are meant to rejoice as the workaholic Lee lives the life that "woman behind screen" (the emoji her friends use for her) was missing out on. The novel is an "Eat, Pray, Love" for a heroine in the middle of a divorce from devices.

For a book so squarely anti-technology, "Loneliness & Company" delivers an oddly mushy view of our tech overlords themselves. Lee's joie de vivre infects her co-workers and bosses, who likewise begin to think that loneliness is something to be felt rather than effaced. "I'd rather have a world of lonely people than a world of numb ones," Janet declares. She absconds to Europe to try "wandering without a destination" instead of using her Maps app. In "Loneliness & Company," tech regulates itself with a long view on what's best for humanity. It's a delusional tale, as far from reality as a dating profile. IRL, companies like Replika have marketed the emotional benefits of their companion apps while being careful not to call what they provide mental-health support, lest the F.D.A. ask them out for coffee.

"Annie Bot" and "Loneliness & Company" are literary fiction for the concerned citizen who can't put her phone down, in that both books underwrite tech companies even as their authors think they're typing out takedowns. As critiques of A.I., these novels miss the mark by avoiding the market in which our romance with tech unfolds.

A book I kept returning to while reading these novels was Kate Folk's story collection, "Out There." In two stories, male humanoid robots, designed to replace low-wage nursing-home workers, have their technology hijacked by a Russian company that uses them to target lonely women on dating apps. Called "blots," the robots can be identified by their unusual sincerity. At a bar in San Francisco, a blot named Roger tells his date, Meg, that he was just "wandering through Golden Gate Park, hoping you would contact me." When the scam is uncovered, Roger is abandoned by the Russians, essentially laid off. Meg, who is struggling financially, falls for him, understanding that they're the same: two drones trying to survive in a city ruled by giant tech companies that foster a culture of disposability, pivoting when it suits them, dumping whoever doesn't live up to their model fantasies.

It's too late to warn people off tech; we're emotional cyborgs now. We wait, like scrap metal on a heap, for someone who thinks we're shiny enough to swipe. Better to aim your arrow at the companies promising to guarantee that shine if we just pay for premium dating apps, or companies getting users hooked on bots that could ghost them in the event of an update or a corporate acquisition. "It's not you, it's a strategic realignment," you can imagine someone's chatbot boyfriend saying as he signs off forever. Though they try to scare us away from artificial intelligence, "Annie Bot" and "Loneliness & Company" are out of synch with its real dangers. Don't hate the player, hate the gamification. ♦

BOOKS

THE MISSING LINK

How Delmore Schwartz tried to change poetry.

BY MAGGIE DOHERTY

Delmore Schwartz died in the early morning of July 11, 1966, in an ambulance on the way to Roosevelt Hospital. He'd been living alone in a seedy hotel near Times Square, reading compulsively and scribbling in the many notebooks that he kept during his last, itinerant years. At fifty-two, he was no longer the precocious young writer and critic—"blazing with insight, warm with gossip," as his friend John Berryman described him—who had charmed poetry's old masters and young upstarts alike. He was often drunk, paranoid, and deeply unwell; friends failed to recognize him in the street. Schwartz spent the hours before his death banging about his hotel room, then decided to take out the trash. He suffered a heart attack in the elevator, stumbled onto the hotel's fourth floor, and lay on the ground for more than an hour, annoying other residents with his inarticulate cries. After he died, his body went unclaimed for days. In "Humboldt's Gift" (1975), a novel memorializing Schwartz, Saul Bellow reflected on his friend's sad end: "At the morgue there were no readers of modern poetry."

Schwartz and his peers—a group of gifted, haunted poets that included Berryman, Randall Jarrell, Robert Lowell, and Theodore Roethke—often complained that they lived "in a period inhospitable to poetry." Starting out after the innovations of modernism, these men found it hard to write in the shadow of Pound and Eliot, and hard, too, to write from within a burgeoning American empire, whose values were not their own. A second Lost Generation, they womanized, self-medicated with alcohol and amphetamines, and languished in university English departments, where they taught to pay the bills. Casting about for a distinct poetic identity, they imagined they'd someday find success. Berryman, in one of his Dream Songs, describes them waiting "for fame to descend / with a scarlet mantle & tell us who we were."

More than any other poet of this generation, Schwartz wrestled with the challenge of writing poetry after Pound. He analyzed it in his criticism, identifying the forces that stymied modern poets (the waning of religion, the lack of an audience) and suggesting how they could forge ahead. Meanwhile, in his own work, he both imitated the poets he admired and questioned their most stringent dicta, particularly Eliot's edict that poetry be "impersonal." Obsessed with his unhappy childhood, and aware of the social and political significance of his life story, Schwartz made his great subject himself. In lyrics, in short fiction, and in his long autobiographical poem "Genesis," he wrote about his parents' fractious marriage, his earliest memories, his ancestors, his dreams. His deeply personal poetry anticipates the confessional turn of the late nineteen-fifties and early sixties, although by the time that revolution came around, Schwartz was too broken to participate.

Indeed, though Schwartz was once praised ecstatically by leading critics of his time, he went missing from anthologies in the eighties, and is now better known for his dramatic life than for his verse dramas. "The Collected Poems of Delmore Schwartz" (Farrar, Straus & Giroux) seeks to change this. Edited by the poet Ben Mazer, who previously edited "The Uncollected Delmore Schwartz" (2019), the volume is the latest in a string of posthumous publications, each clamoring for our attention like ever more insistent knocks upon a door. In a brief introduction, Mazer calls Schwartz "a controversial poet who could elicit fierce criticism or the highest praise"; he was by turns allusive and intimate, philosophical and direct. He was also unmistakably important to American poetry, the missing link between the obscurity of "The Waste Land" and the forthright

Schwartz sought a new intimacy in verse, refracting his own pain on the page.

ILLUSTRATION BY JAN ROBERT DÜNNWELLER

quality of Lowell's "Life Studies." Even if his poems didn't always succeed, they served as inspiration to others. "I wanted to write. One line as good as yours," Lou Reed, who was Schwartz's student at Syracuse, once wrote. The emblematic tortured poet, Schwartz is worth reading not simply for what he achieved but for what he made possible.

Schwartz was born in Brooklyn in 1913, to Eastern European Jewish immigrants who saw America as the place where you could dream big. His charming father, Harry, made a small fortune in real estate; his mother, Rose, a great beauty, managed the home. The marriage was unhappy: Harry loved money, freedom, and women, and he often felt constrained by Rose's demands. In 1923, he left the family for a glamorous life in Chicago; he died seven years later, after losing most of his fortune in the stock-market crash. Schwartz, who had anticipated inheriting his father's money and taking his place among the American aristocracy, never got over the loss of this imagined future.

Living in shabby apartments with his younger brother and his perpetually unhappy mother, the preteen Schwartz turned to literature as an escape. He borrowed armfuls of books from the public library: O. Henry, Sinclair Lewis, Alexandre Dumas. A three-dollar copy of Hart Crane's "The Bridge" sparked an interest in poetry, but he didn't become serious about the craft until college. (Schwartz started at the University of Wisconsin but, lacking sufficient funds for out-of-state tuition, transferred to New York University, where he earned a degree in philosophy.) On campus, he set himself a rigorous daily schedule that included reading Spinoza, listening to Bach, and studying at least one poem by Blake, Dante, or Milton. This apprenticeship likely accounts for the high rhetoric of his initial efforts, which sometimes sounded like they could have been written centuries earlier.

By the time he graduated from college, in 1935, Schwartz had come to see poetry as a calling. But he had also begun to write short fiction and essays, and his breakthrough was not in poetry but in prose. In the course of a summer weekend, he drafted a deft, moving short story called "In Dreams Begin Responsibilities," its title taken from Yeats. The story is set in a movie theatre in 1909, where the narrator views a silent film. He watches his parents, dressed in their finest, embark on a date to Coney Island, where they stroll the boardwalk and ride a merry-go-round before deciding, somewhat precipitously, to get married. As the date unfolds, the narrator grows increasingly distressed. He weeps, leaves the theatre for a spell, and then, after his father proposes, addresses the actors directly: "Don't do it. It's not too late to change your minds. . . . Nothing good will come of it, only remorse, hatred, scandal, and two children whose characters are monstrous." He's reprimanded by the usher—"You can't carry on like this"—then wakes up in his own bed, realizing that he'd viewed the film in a dream.

"In Dreams" wasn't published until 1937, when it appeared as the lead piece in the first issue of the revived *Partisan Review*. (Schwartz, a natural networker, became the magazine's poetry editor soon thereafter.) But Schwartz sensed early on that he'd accomplished something important. He'd landed on not one but two ideal narrative devices—the film and the dream—that allowed him to probe the most painful parts of his past while also distancing himself from them. Through the figure of the usher, Schwartz chides himself for being so invested in his parents' story, even though this overinvestment is what inspired the story in the first place. The structural complexity of "In Dreams"—its multiple frame narratives and time lines—both refracts and amplifies its emotional force.

Schwartz began doing something similar in his poems. In "Prothalamion" (1938), he revisited one of his most traumatic memories, an occasion when his mother, with young Delmore in tow, tracked down her husband at dinner with another woman and delivered a harangue:

> Her spoken rage
> Struck down the child of seven years
> With shame for all three, with pity for
> The helpless harried waiter, with anger for
> The diners gazing, avid, and contempt,
> And great disgust for every human being.

The memory is embedded in a poem about a promising marriage; as in the short story, Schwartz stages an encounter with the pain of his childhood and, at the same time, mediates it. In "The Ballad of the Children of the Czar," a poem from the same period, he uses the image of a "bounding, unbroken ball" to link life in tsarist Russia, his father's country of origin, to his own childhood in Brooklyn. The poem suggests that the individual is shaped by history in ways that he cannot see.

For Schwartz, the personal was always entwined with the social and the historical, and sometimes with the mythic. He described himself as the "poet of the Atlantic migration, that made America"; to write about his family of origin was to tell the story of a generation of Jewish immigrants and the nation they helped create. But his art also served therapeutic purposes—or so he hoped. An admirer of Freud's work, he believed that only by revisiting his childhood, in poem after poem, could he come to understand himself. "When you look at any man, remember that you do not truly see him," Schwartz wrote. "For he is his past and his past is unseen. . . . He carries his habits, which are his childhood, strapped to him like his wristwatch, beating."

Schwartz's first book, "In Dreams Begin Responsibilities," appeared in December, 1938, the same week that he turned twenty-five. It contained the short story about his parents as well as more than thirty lyrics and a verse play, a Marxist-Freudian take on Shakespeare's "Coriolanus." His peers were dazzled: Lowell thought him a "sensationally reasonable and gifted poet," and Berryman, who taught composition with Schwartz at Harvard, started referring to his friend as "God." The Old Guard was quite taken with the book, too: William Carlos Williams liked it, as did Wallace Stevens. Allen Tate offered arguably the most important words of praise, telling Schwartz, in a letter, that his work was "the first real innovation that we've had since Eliot and Pound."

If the collection seemed to appeal to everyone, that was partly by design. Schwartz craved praise throughout his career, and even went so far as to orchestrate good reviews, telling his publisher which reviewers to solicit and which to avoid. (He referred to the latter as "my hated enemies.") He was an innovator as well as a traditionalist; he fittingly called his lyrics "poems of ex-

periment and imitation." Sometimes the imitation was all too evident: the sonnet "O City, City" contains images—"six million souls" in a subway car, an office building that "rises to its tyranny"—that wouldn't be out of place in "The Waste Land." But Schwartz also engaged with ideas more than most lyricists did, deploying concepts from social theory and citing philosophers by name. In the poem "In the Naked Bed, in Plato's Cave," he sets up a tension between philosophy and physical experience, then resolves it by the poem's end.

He works through a comparable tension in one of his best and most anthologized poems, "The Heavy Bear Who Goes with Me." Channelling a theme from Yeats, Schwartz examines the conflict between the body's appetites and the soul's aspirations. The body is figured as a "heavy bear," a "strutting show-off . . . bulging his pants," who "trembles to think that his quivering meat / Must finally wince to nothing at all." This is coarse language for a coarse being, and it's contrasted, later in the poem, with the elegant expression of the soul's desires. The bear

> Stretches to embrace the very dear
> With whom I would walk without him near,
> Touches her grossly, although a word
> Would bare my heart and make me clear

The soul's longings are conveyed in lovely alliterative lines, linked by their end rhymes; the bear's "gross" touch interrupts this pattern. The "bare" soul is neatly contrasted with the "bear" of the body, suggesting a duality that can be reconciled only in art.

Like Berryman and Dylan Thomas, Schwartz admired Yeats—he sent the dying poet a copy of his first book, hoping for a kind blurb—but he was even more influenced by Eliot. In "Tradition and the Individual Talent," the famous essay from 1919, Eliot exhorted his peers to view their work as part of a vital, evershifting literary tradition; the "mature" poet gives himself over to this tradition, recombines it, and arrives at an expression that is completely his own. Eliot challenged Wordsworth's suggestion that poetry was "emotion recollected in tranquility." For him, creation was not passive but active, and the emotions used in a poem need not be experienced by the poet himself. "Poetry is not a turning loose of emotion, but an escape from

emotion; it is not the expression of personality but an escape from personality," Eliot wrote. "The emotion of art is impersonal."

Schwartz agreed with much of this: in a 1949 essay, he wrote that the poet must be aware of his "inheritance," including "an inescapable relationship to all the modern and modernist poetry which has been written." But he had a different idea about how the poet might use his emotions and his past. Since the age of seventeen, he'd been working on a long narrative poem called "Having Snow," which became "Genesis." Like Wordsworth's "The Prelude," the poem would trace the maturation of a poet, an alter ego named Hershey Green, beginning with the migration of Hershey's ancestors, then moving through his childhood, his adolescence, and his young adulthood. Schwartz developed a formal schema: Hershey would speak in lines of rhythmic prose, broken across the page like poetry, while a group of ghosts, functioning like a Greek chorus, would offer analysis of Hershey's monologue in metered verse. The poem would not only show how poetic consciousness is formed but also, as Schwartz wrote in a brief preface, help "regain for Poetry the width of reference of prose."

It was a brilliant conceit, but the execution left something to be desired. In the first book of "Genesis," the only one published during Schwartz's lifetime, Hershey dwells on minutiae from his childhood: his exile from his mother's bedroom following the birth of his younger brother, his shame at being disciplined by his kindergarten teacher, his first funeral procession. The ghosts aim to widen the significance of these events, but their observations are usually either overcomplicated or banal—sometimes both. At one point, they connect the Green family's story to immigrant history more generally, suggesting that each family member's desires—for love, or money, or a child—were shaped by historical forces:

> What is the cause which wins the mother's mind?
> It is America which moves through her,
> America's prosperity, Jack Green's prosperity
> Decide her mind amid the fearful sum!
> Capitalismus penetrates the heart!

The insights are persuasive, but the language is decidedly unlovely. Throughout, Schwartz sacrifices the aesthetic quality of the poem on the altar of social analysis, favoring exposition over image and argument over art. The best moments are those in which we see a poet's sensibility forming. There's a delightful scene in which Hershey, as a

child, is kissed by a pretty young woman and calls out "trolley!" because she gives him the joy that a streetcar does.

"Genesis" was published in the spring of 1943, against the advice of early readers, including Schwartz's publisher at New Directions, James Laughlin. Though some of Schwartz's friends reviewed the book positively, others wrote to him directly with their criticisms. Dwight Macdonald, Schwartz's colleague at *Partisan Review*, told him that the book was "unreadable, flaccid, monotonous, the whole effect pompous and verbose." Such responses exacerbated the doubts that had plagued Schwartz since the publication of "In Dreams." He'd long harbored fears that his talents would desert him, or, worse, that he wasn't as talented as people said. The failure of "Genesis" confirmed them.

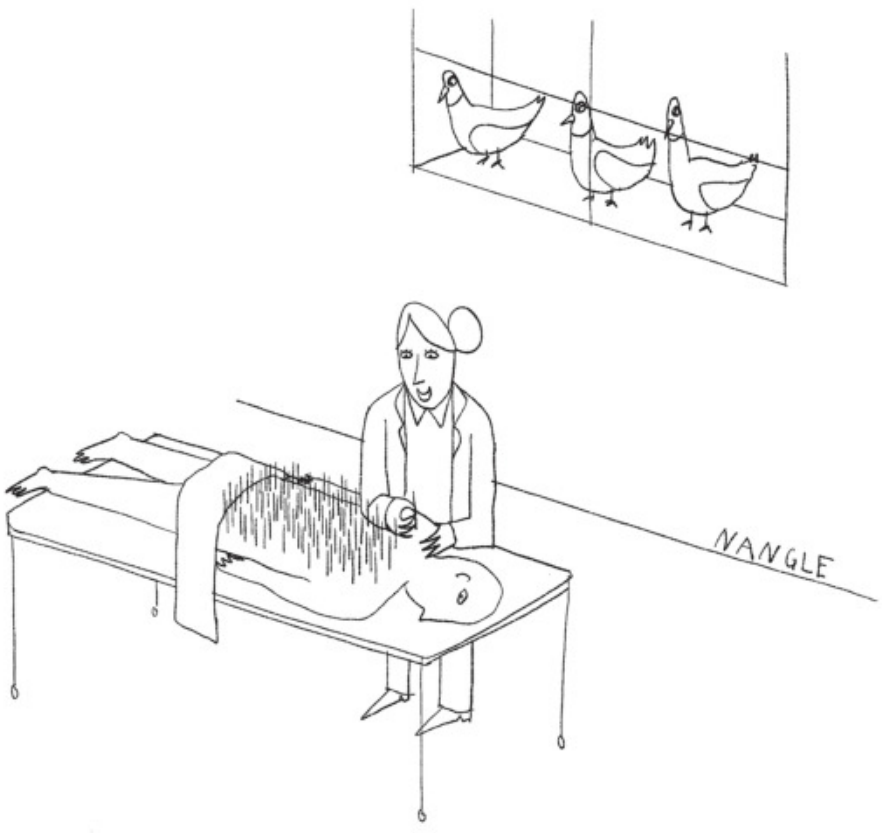
For Schwartz, 1943 was the beginning of the end. His first wife, the writer Gertrude Buckman, left him. His insomnia, with him since his teen-age years, increased, as did his intake of alcohol and barbiturates. For years, he'd struggled with a mood cycle marked by high highs and low lows; the former took away his powers of discernment, and the latter left him struggling to write at all. Only thirty years old, he felt his prime was past. "I am older than most, older than my age," he wrote in his journal. He continued to work on "Genesis"—some later excerpts are included in the "Collected Poems"—but he stopped thinking of it as his magnum opus. He joked darkly that the second book would be published posthumously.

Contemporary critics tend to breeze through the last two decades of Schwartz's life, hitting only the saddest events: the second divorce; the increasing alcoholism; the unpublishable poems, many written during bouts of mania; the money problems; the undignified death. (Those who want all the gritty details can consult James Atlas's excellent biography.) His receipt of the prestigious Bollingen Prize, in 1959, for a book of new and selected poems, seems like a high point, but Schwartz probably intuited that the prize was awarded less out of admiration than pity.

It's certainly true that Schwartz fell off after "Genesis." (Mazer's modest claim is that reëxamination of the later collections "discloses that there are good things in these books.") He seemed to stop taking himself seriously as a poet, adopting a fool's persona in his 1950 collection, "Vaudeville for a Princess," and composing poems for "Summer Knowledge," the 1959 collection, that were more sound than sense. ("A tattering of rain and then the reign / Of pour and pouring-down and down.") He largely stopped writing about his own life and wrote instead about mythical and famous men: Abraham, Narcissus, Lincoln.

But there are some revealing poems from the last decades, their pathos apparent when we compare them with the early work. "The World Was Warm and White When I Was Born" earns its nostalgia, unlike some of the rueful poems from "In Dreams," which, though written by a twentysomething, sound like the musings of an old man. The poems "Jacob" and "Lincoln" are compelling character studies, far more interesting than the ghosts of Marx and Freud who appear in the early poetry. And in "Seurat's Sunday Afternoon Along the Seine," a long, Auden-esque ekphrasis from "Summer Knowledge," Schwartz returns to a favorite theme—the costs of a life lived mostly in the mind—that he previously explored in the 1938 poem "Far Rockaway." In that poem, he presented a novelist who, watching beachgoers revel on a sunny day, finds that he cannot give himself over to unthinking pleasure. Schwartz portrays the same resistance in "Seurat's Sunday Afternoon," depicting the artist as an observer, someone who cannot immerse himself in experience. The poem ends with some of the most affecting lines he ever wrote:

> Can we not hear, if we but listen to what
> Flaubert tried to say,
> Beholding a husband, wife and child on
> just such a day:
> *Ils sont dans le vrai!* They are with the truth,
> they have found the way . . .
> Can we not also hear
> The voice of Kafka, forever sad, in despair's
> sickness trying to say:
> "Flaubert was right: *Ils sont dans le vrai!*
> Without forbears, without marriage, without
> heirs,
> Yet with a wild longing for forbears, marriage, and heirs:
> They all stretch out their hands to me: but
> they are too far away!"



"Say goodbye to back pain and pigeons."

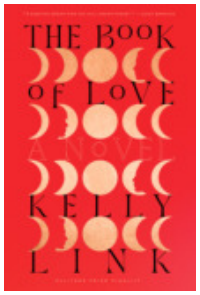
Once again, Schwartz draws on the lit-

erary past—the work of his "forbears"—to speak to his present-day dilemma. He places himself in a long tradition of writers torn between their desire to experience the world and their compulsion to record that world for posterity. Like Kafka, Schwartz was often sick with despair, but he never stopped trying to capture life in ways that felt both familiar and new.

Schwartz lost almost everything in his last years: his second wife, the writer Elizabeth Pollet; his perspicacity; his house in rural New Jersey. But he never quite lost his genius for conversation—people gathered regularly in bars to listen to him discourse on politics and read aloud from the books he loved—and he never lost his friends. They lent him cash, secured him teaching appointments, salvaged rough drafts for publication, and raised funds to support his mental-health treatment. When he died, they made art in his honor: Berryman wrote his Dream Songs, Lowell wrote a second poem for Schwartz (the first had been published in "Life Studies"), and Bellow published "Humboldt's Gift." In different ways, each of these writers carried on Schwartz's legacy, transforming personal experience into great autobiographical art.

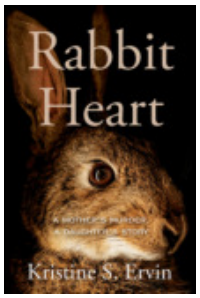
At a poetry reading that memorialized Schwartz, the month after his death, Lowell reflected on what his friend had taught him. They'd briefly lived together in Cambridge, and Lowell had admired Schwartz's passion for ideas and his dark wit; their conversations were "absolutely dazzling, and an education to me," Lowell told the audience. He then read three of Schwartz's poems: "The Heavy Bear," a bit of light verse from "Summer Knowledge," and "Starlight Like Intuition Pierced the Twelve," a poem from 1943 that Schwartz had once said was a favorite. In the poem, Jesus' twelve disciples fret about their flaws. Their savior is perfect, all-knowing, and the disciples, newly aware of what "unnatural goodness" looks like, are horribly imperfect in comparison. But by the poem's end the disciples have accepted their condition: "we shall never be as once we were / This life will never be what once it was!" They acknowledge that they are human, and prone to erring. They try and fail to be good, and then they try again. ♦

BRIEFLY NOTED

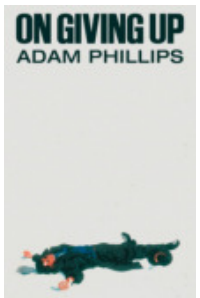


The Book of Love, *by Kelly Link (Random House)*. This novel, the first by an author celebrated for her short fiction, follows a group of teen-agers who are determined to live normal lives amid intrusions of magic. Three classmates wake up to find that they have died; confused and annoyed, they make a deal with two mysterious beings, who allow them to return home in exchange for their participation in a series of trials. A supernatural power struggle ensues, but the book devotes most of its attention to the ordinary world, slowing the action to examine the relationships between its characters, most of whom are queer. Here, a magical quest is less absorbing than the act of texting a crush.

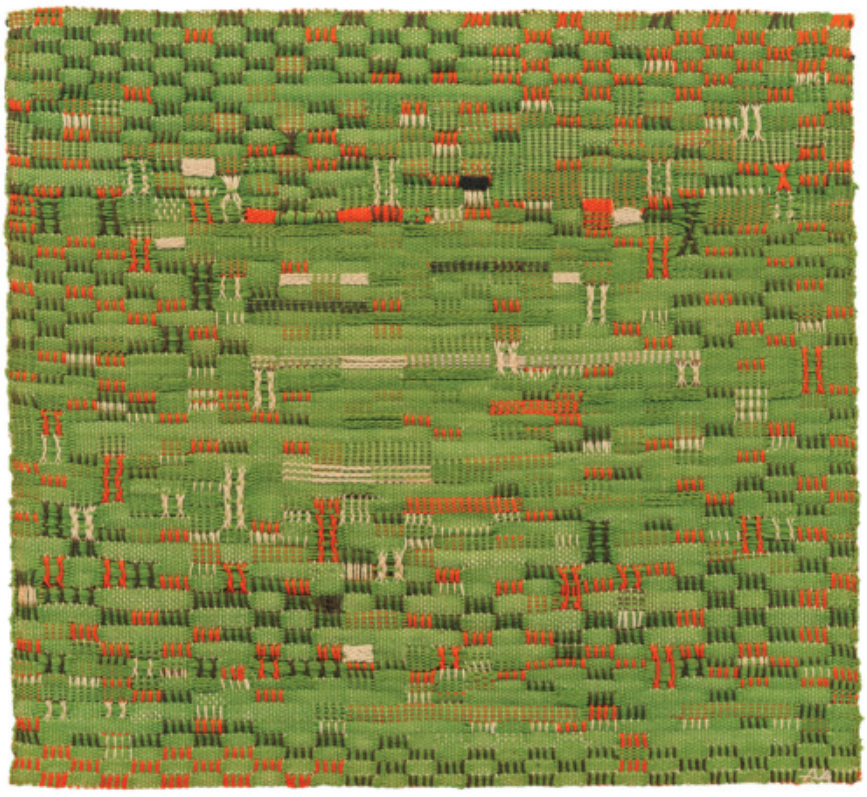
What Kingdom, *by Fine Gråbøl, translated from the Danish by Martin Aitken (Archipelago)*. In this striking début novel, Gråbøl documents daily life in a psychiatric ward for young people in Denmark. Waheed blasts 50 Cent and loves junk food; Marie lives a few floors above her mother; and the narrator, who remains nameless, recounts her struggle with bipolar disorder. Alternately lucid and ecstatic, the novel touches on the welfare system's focus on bottom lines—"benefit rates and supplementary payments, diagnoses and deductibles"—and challenges the perception of mental illness as an invisible affliction, "inaccessible to any other." Gråbøl's portrait of the residents' and caretakers' interconnected lives constructs a communal existence out of individual pain.



Rabbit Heart, *by Kristine S. Ervin (Counterpoint)*. This memoir stretches across a quarter century to chart the investigation into the author's mother's murder, which occurred in 1986, after she was abducted from a mall parking lot in Oklahoma City. Ervin, who was eight at the time of the tragedy, follows the case with devastating rigor, shingling its developments with her memories of growing up without a mother. The adult Ervin, knowing that her mother was sexually brutalized, attempts to undo how that knowledge seems to have settled in her body—in the form of muscular dysfunction—but she also accepts the lasting nature of her grief: "Maybe I'll always be the daughter, retracing her final footsteps to the car, seeing just how close I can get."



On Giving Up, *by Adam Phillips (Farrar, Straus & Giroux)*. Like many of Phillips's previous works, this roving collection of writings fuses the lexicon of psychotherapy with literary criticism to upend conventional ideas about common emotional experiences—among them repression, longing, and loss. Phillips enlivens these explorations with examples from literature and history: Kafka and Shakespeare appear, as does the Crow Nation, whose existence was radically altered by the decimation of the animals on which its people depended. Though occasionally meandering, Phillips's agile treatment of familiar ideas often yields compelling analyses, as when he argues, in the titular essay, that our cultural prohibition on "giving up" compels us to "think of our lives in terms of losses and gains, or profit and loss."



In works like "Pasture" (1958), texture and restraint produce ravishing beauty.

THE ART WORLD

WARP SPEED

Anni Albers helped establish weaving as art—then left it behind.

BY JACKSON ARN

Imagine you'd been born in 1899. Imagine living through the invention of the Model T, the jet aircraft, the liquid-fuelled rocket, and the computer chip. Now imagine looking back on all this in 1965 and writing, as though with a shrug, "How slow will we appear some day?"

It takes an uncommon turn of mind to survive decades this dizzying and then sum them up with perfect nonchalance—but a lot of the greatness of Anni Albers lay in her ability to stay undizzied and keep doing her thing, year after year. Not that she was afraid of innovation; her thing just happened to be weaving, an art form that, by her own calculation, had not changed in any fundamental way since the Stone Age.

Critics reach for a few key words with Albers: "crisp," "precise," "mathematical." I would like to propose "frightening." Her work arouses the suspicion that beauty is simple and we've all been overthinking it. None of the shapes or colors in "Pasture" (1958), a smallish plot of mainly red and green threads, would be out of place on a roll of Christmas wrapping paper. The trick is that each component lingers long enough to make any change feel like an event; checkerboard red-and-green switches to green-on-black, then green-on-black but with stutters of white and red. Patterns unfold horizontally, but every so often a twisted pair of vertical threads (it's called a leno weave) slashes its way out of the grid. An invisible logic, mysterious but never precious, presides. Most visual art addresses whoever happens to be looking at it. "Pasture" stares straight through you, at some distant, tranquil future in which primordial beauty is the only kind left.

Albers was in her early twenties when she began to study arts and crafts at the Bauhaus, the German school that was to sleek, enlightened concision what West Point is to beach-storming. Painting, her first choice, was off the table, so she ended up in the textiles department, along with most of the other female students. In 1933, the year the Nazis forced the school to shut down, she and her husband, Josef Albers, fled to Black Mountain College, in North Carolina, and eventually settled in Connecticut, where she would remain until her death, in 1994. The question quoted up top comes from her book "On Weaving," still a holy text for fibre artists and, like most holy texts, prone to stern, occasionally nutty commandments. Color should be "third in importance" for weavers, after texture and—isn't it obvious?—"yarn character." Pre-Columbian weavings are celebrated for their clear-headed, abstract flatness. All but a few medieval European tapestries are sent to art hell for the sin of trying to be too much like paintings.

Whatever you think about painting's dethroning in the past few decades, it has made room for worthy textile-makers. Albers is one—her 2018 Tate retrospective got raves—though her place in the ongoing fibre renaissance isn't as comfortable as you might suppose. "Weaving Abstraction in Ancient and Modern Art," a tiny marvel currently on view at the Met, left me feeling that her work has little in common with that of the twentieth century's other great weavers—none of the improvisational fancy of Lenore Tawney or the sculptural oomph of Olga de Amaral. Judging from the Met's samples, Albers isn't too much like the pre-Columbians, either. (In some of the Incan weavings displayed here, color is plainly *first* in importance.) More than anyone else in the show, she wallows in constraint; her work is exquisite without quite being exuberant. The second you see a Sheila Hicks, you are invited to gape, but an Albers like "Development in Rose I" (1952) introduces itself as a grid of pinkish and greenish threads, nothing more. Out of the nothingness, though, comes loaves-and-fishes abundance. The textures keep multiplying: this time, the leno weave has the wincing firmness of surgical stitching, while some of the paler rose threads have

ANNI ALBERS / COURTESY © THE JOSEF AND ANNI ALBERS FOUNDATION / ARS, 2024 / © METROPOLITAN MUSEUM OF ART; PHOTOGRAPH BY PETER ZERAY

a lovely softness and shimmer. I don't get drunk on this textile, but I couldn't burn out on looking at it any more than I could burn out on looking.

You dream of painting but are sent off, with a sexist shove, to be a weaver instead. You spend the next forty-odd years proving you're as good at making art as anybody in the world, and, almost as improbably, the world admits that you are right. Your textiles are honored with a show at MOMA in 1949, you write the "Weaving, Hand" entry in the Encyclopædia Britannica in 1963, and then, at the end of the sixties, with more than a quarter century left to live, you give up weaving for printmaking.

The obvious question in "Anni Albers: In Thread and On Paper," a show at Austin's Blanton Museum of Art which deals mainly with the back half of her career, is *why*? Physical frailty must have been a factor, though when I spoke to Fritz Horstman, the show's curator and the Josef and Anni Albers Foundation's education director, he didn't rule out run-of-the-mill ambition. Give an artist a MOMA show and she'll crave a bigger one—and printmaking, as Albers once said, "allows for broader exhibition and ownership of work. As a result, recognition comes more easily." True, but still disappointing, particularly if you think that fibre art has had enough trouble without fibre artists adding to it. This might explain why Albers's prints are sometimes deemed tamer than her textiles. There's a powerful reverse prejudice at work, similar to the one that vexed Bob Dylan fans after he went electric: what to do when a great artist pivots to a more mainstream, less self-consciously "authentic" art form?

The right response in both cases is, of course, to get over yourself. Albers lost plenty when she doubled down on prints, but she gained at least as much. Color, for one. The 1973 screen print "Do I," with its hundreds of parallelograms and triangles in tingling pink and yellow, looks the way ripe citrus tastes. (It sort of looks like citrus, too—notice the orange rind around the border.) As with Albers's weavings, an almost-pattern controls which shape goes where, but the medley of textures is gone; this isn't an image you want to run your hands over. Your gaze does the work instead. Trying to stare at one of the triangles, I found I couldn't for more than a split second—I kept slipping one way or another, until the overdose of pink and yellow made my eyes water. The old formal hierarchy has changed, but the new one is just as strict; shape emphasizes color as color once emphasized texture. Something similar could be said about "Homage to the Square," the interminable series that Josef began two decades earlier, around the time he started lecturing at Yale. The difference is that Anni's prints rarely make you feel as though you are back in a classroom. The only assignment is to enjoy.

"Do I" and many of the other prints at the Blanton were produced by fine-art presses. Albers would send them gouache-on-paper studies, and Horstman has made the savvy choice to display some of those, too, bringing out the lovable flaws in the final versions. Look closely. In the prints, shapes that were intended to be precisely corner to corner don't quite touch, or overlap by half a millimetre. Whether Albers's hands made them or not, they appear handmade; even the most mathematical, strictly regimented ones have a gleeful bounce. The lithograph "TR II" (1970) stars only one shape, a fat isosceles triangle, and three colors: green, eggplant, and silvery white. A few rules control how these interact. Triangles can be eggplant or silver—green is the background. They can point up or down, but not left or right. Touch is allowed, but only corner to corner or long side to corner. And with that, we're off.

Bertrand Russell thought that mathematics had "a beauty cold and austere, like that of a sculpture." It is hard to look at Albers's prints and weavings, with their grids and laws and hard-edged geometric shapes, without thinking of math, but I've never found their beauty to be austere, unless there is something a little playful about austerity itself when raised to the right pitch. So it goes in "TR II," not Albers's culminating work by any means, but probably the one I'd throw in a time capsule and save for that calm, distant future. Perfect obedience leads to perfect chaos. Rules eat themselves alive; huddles of triangles create negative green shapes, including triangles; and it is all so wild and twitchy and overjoyed to be here that anyone could forget it has only four ingredients. Then again, so does DNA. ♦

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POP MUSIC

BLEEDING HEART

Olivia Rodrigo's exuberant yearning.

BY AMANDA PETRUSICH

The opening moments of Olivia Rodrigo's seventy-seven-date Guts World Tour—which began in February and arrived at Madison Square Garden for four sold-out nights in early April—feature a video of the pop star sprinting down a dumpy hallway, then rapping her knuckles on a purple door. Anyone attuned to Rodrigo's musical disposition knows that whatever is waiting on the other side is probably not virtuous, exactly, but is almost certainly a good-ass time. Last Saturday, as her band slammed out the opening chords of the night's first song, the punkish, frothing "Bad Idea Right?," Rodrigo appeared onstage in a silver sequinned miniskirt with a matching bralette and black combat boots. The crowd was instantly united in a kind of lawless exuberance. The feeling in the room was: Let's give ourselves something to regret in the morning!

Rodrigo, who recently turned twenty-one, is funnier and less fussy than the other pop stars in her echelon. She is not apolitical (she has invited abortion funds to set up information booths at Guts shows, and is donating a portion of the tour's proceeds to support women's reproductive health), and she has not cultivated an image of sexlessness, piousness, or self-seriousness. She appears, instead, to revel in pleasure—even when she knows that whatever it is she's thirsting after will probably get her into trouble.

Rodrigo's best songs feature her clowning on herself—"Everything I do is tragic / Every guy I like is gay," she sang while charging around the stage during a performance of "Ballad of a Homeschooled Girl," a raucous song teeming with excellent one-liners—or meditating on a choice made in pursuit of fleeting bliss. That sort of thing might not seem radical—who among us has not muttered, "Fuck it, it's fine," and run directly toward the wrong person, as Rodrigo gleefully recounts doing—but, in an era in which a woman's desire is still often thought of as inherently dangerous, Rodrigo's unself-consciousness about what she wants can feel nearly revolutionary. She never projects superiority, and her relatability—perhaps the most powerful cultural currency of our time—doesn't feel overly engineered. She knows that true yearning is always a little humiliating. "God, love's fucking embarrassing," she sang in the middle of "Love Is Embarrassing," before turning one of the song's more defeated proclamations—"How could I be so stupid?"—into a blithe punch line. This is another recurring theme of Rodrigo's writing: the indignities of growing up when you have to learn everything the hard way.

The Guts tour is the first time that Rodrigo has consistently played arena-size venues. (For her last major tour, in 2022, she booked theatres and concert halls, telling *Billboard* she didn't want to "skip steps" in her career.) Rodrigo was a Disney Channel star in the late twenty-tens, beginning when she was thirteen. She rose to global prominence in January of 2021, with the release of "Drivers License," a gentle but devastating ballad about a relationship gone awry: "Guess you didn't mean what you wrote in that song about me / 'Cause you said forever, now I drive alone past your street."

The song, which Rodrigo co-wrote with the producer Daniel Nigro, destroyed an array of streaming records. Rodrigo's first album, "Sour," which arrived that May, débuted at No. 1, was nominated for seven Grammys, and eventually went quadruple platinum. She released "Guts" in September of 2023.

Many of Rodrigo's songs meditate on choices made in pursuit of fleeting bliss.

ILLUSTRATION BY K. WROTEN

Rodrigo's voice is substantive—on her burlier songs, there are moments when she reminds me of Adele—but it contains a tiny tremble that gives her work heart. "The better a singer's voice, the harder it is to believe what they're saying," David Byrne once noted; Rodrigo gets this, and never grasps for perfection. At M.S.G., she performed "Drivers License" seated at a piano, while fog rolled across the stage. "I still fucking love you, babe," she wailed on the bridge. If she's over the heartbreak now, it was hard to tell. In the crowd, people held one another and swayed.

Though tours of this magnitude tend to be impeccably coördinated, down to breaks for banter, Rodrigo was appealingly low-key and natural. The Guts show has five costume changes, which felt modest compared with Beyoncé's Renaissance tour (nine) or Taylor Swift's Eras (sixteen). At ninety minutes, it is also far shorter than both of those. Rodrigo, a stronger singer than dancer, avoids elaborate choreography, though she is preternaturally good at galloping across a stage, knees high, waving an arm around. A scrum of talented dancers sometimes followed behind her like a swarm of bees. It feels odd to call a run this ambitious "small"—and, to be fair, at one point Rodrigo sailed above the arena on a crescent moon—but I appreciated the sanity and the precision of its scope. Rodrigo's performances are true to the arrangements on her records—she is not Bob Dylan on his Never Ending Tour, boldly reinventing a vast and varied catalogue—but the evening still felt spontaneous, even intimate. When she performed "Favorite Crime," a wounded acoustic song from "Sour," about (what else?) behaving badly while in the throes of love, she sat cross-legged on the stage with her guitarist. For a few minutes, the vibe felt more coffeehouse than world-tour.

The crowd was largely female and very young—a good portion was under twelve, I'd guess, and though I wasn't quite expecting retirees, I was still startled by the median age, particularly considering the candor of Rodrigo's lyrics and her jocular comfort with certain expletives. Her fans sang along the entire time, loudly and persistently enough that it was often impossible to hear Rodrigo. Midway through the show, she paused to ask, "Did anyone come with their mom or their dad tonight, maybe? I love going to concerts with my mom and dad! Hey, guys! Hey, sweet families!"

The kids were exquisitely dressed. A time comes in every grown person's life in which the fashion of her adolescence becomes cool again. For anyone who came of age in the late nineties and still recalls the moment in which grunge (fading) and pop-punk (ascendant) had a brief but potent sartorial collision, the look of the Guts tour, both onstage and off, will feel deeply familiar. It's X-Girl-era Kim Gordon meets Ashlee Simpson circa "Boyfriend"—high-school cheerleader, but make it goth. Last summer, I committed the grave mistake of rolling up to an Eras performance in Levi's, Converse, and a T-shirt (in my defense, the concert was in New Jersey), and received myriad looks of pity from the crowd. "We must dress," I texted my companion (male, thirty-two) before the Guts show. I picked out a vintage Marc Jacobs dress with a Peter Pan collar, and pulled my hair into a high ponytail tied with a black bow. He wore a Megadeth T-shirt. I am not sure we fully assimilated, but at least no one whispered "narc" when we walked by.

Though Rodrigo's voice feels engineered for big, swooning ballads, she is also unusually good at the sort of bratty, frenetic delivery immortalized, in the early to mid-two-thousands, by such pop-punk acts as Avril Lavigne, Sum 41, and Blink-182. "I wanna get him back / I wanna make him really jealous / Wanna make him feel bad," Rodrigo sings on "Get Him Back!," a prickly song about hating and wanting someone at the same time. It was her final encore of the night, and she performed it wearing sparkly hot pants and a crop top with the phrase "And just like that . . ." scrawled across the front. (The previous night, in another allusion to "Sex and the City," her shirt had read "Carrie Bradshaw AF.") She sang the first verse through a red megaphone, her handheld microphone tucked into her waistband. "I wanna meet his mom," she purred, her voice tender, vulnerable. A beat. "And tell her her son sucks!" (We contain multitudes.) Rodrigo held out the microphone to let the crowd take the song's best lyric, and, in a kind of deranged unison, we stood and bellowed, "Maybe I can fix him!" ♦

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THE CURRENT CINEMA

SNAP JUDGMENTS

"Civil War."

BY JUSTIN CHANG

Is it the end of the world if Kirsten Dunst isn't around to witness it? I'm beginning to wonder. At the mystical aliens-among-us climax of Jeff Nichols's "Midnight Special" (2016), it is Dunst, aglow with Spielbergian wonderment, who compels our surrender to the thrill of the unknown. In Lars von Trier's end-of-days psychodrama, "Melancholia" (2011), Dunst, giving her greatest performance, all but wills her clinical depression into a cataclysmic reality. And I'm tempted to throw in Sofia Coppola's "The Beguiled" (2017), an intimate Civil War gothic in which Dunst, as a dour Virginia schoolteacher, distills the existential gloom of the moment into every shattered stare. It may not be Armageddon, but, from her terrified vantage, who's to say that tomorrow is another day?

A very different civil war swirls around Dunst in "Civil War," a dystopian shocker set in a not too distant American future. The English writer and director Alex Garland has an undeniable flair for end-times aesthetics, and he and his cinematographer, Rob Hardy, rattle off image after unsettling image of a nation besieged. Their camera lingers on bombed-out buildings, blood-soaked sidewalks, and, in one surreal tableau, a highway that has become a vehicular graveyard, with rows of abandoned cars stretching for miles. Plumes of smoke always seem to be rising from somewhere in the distance, and apart from a few congregation zones—a makeshift campsite where kids play with abandon, a crowded block where desperate Brooklynites line up for water rations—the landscapes are eerily emptied out. At night, a deceptive stillness sets in, and the sky lights up, beautifully, with showers of orange sparks. We could be watching fireflies at dusk, if the hard pop of gunfire didn't warn us otherwise.

Strictly as a piece of staging, "Civil War" is as vividly detailed a panorama of destruction as I've seen since "Children of Men" (2006), or perhaps the Garland-scripted zombie freakout of "28 Days Later" (2002). Even Dunst has never stared down a more imposing vision—and stare it down she does, invariably through the lens of a camera. Her character, Lee, is a skilled photojournalist, and if your mind doesn't automatically leap to Lee Miller, celebrated for her stunning images of the Second World War, rest assured that Garland's script is eager to connect the dots. This Lee may not have her namesake's celebrity glamour or her willingness to turn the camera on herself. But Dunst gives the character a comparable steeliness, a cut-the-crap professionalism that gets you immediately on her side. She has fearlessly covered sieges, firefights, and humanitarian crises the world over; now, with a tightly set jaw and an unwavering seriousness of purpose, she's confronting the horror in her own back yard.

The plot comes at us in a rush of details so clipped and vague that you can't help but suspect that they're largely irrelevant. In a fanciful twist, Texas and California have cast their red-blue animus aside and forged the Western Forces, a secessionist axis seeking to topple the President (the ruthless, mirthless Nick Offerman), a despot who has appointed himself to a third term. Florida, not to be outdone, has launched a separatist campaign, too. In response, the President has called in his troops and launched air strikes against American citizens. With these militarized factions attacking one another relentlessly, the entire country has descended into poverty and lawlessness, and Lee has seen and photographed it all. Now she sets her sights on the White House, where it seems that the conflict will finally end, with the President cornered and overthrown.

But, first, there's a treacherous road to travel from New York to Washington, D.C. Along for the ride are two reporters: Joel (Wagner Moura), who tempers his cynicism with a wolfish grin, and Sammy (Stephen McKinley Henderson), a distinguished political writer whose instincts are as sturdily old-school as his suspenders. Then, there's Jessie (Cailee Spaeny), the youngest and most surprising addition to the group. She's an aspiring photographer who idolizes Lee (both of them) and, like many a plucky outsider, becomes a de-facto stand-in for the audience. Jessie is talented, serious-minded, with a purist's preference for black-and-white film.

Kirsten Dunst stars in Alex Garland's dystopian film.

ILLUSTRATION BY CLAY RODERY

She is also reckless and naïve, and Lee is infuriated by her presence on this dangerous mission. Lee has already saved her life once, in an early scene, yanking her out of harm's way shortly before a bomb explodes, leaving behind streams of blood and mangled body parts. There is more carnage to come, and Lee knows that Jessie—indeed, all of them—might not survive.

This isn't the first time Garland has sent a small group of courageous folk on a perilous journey. That's more or less the premise in his screenplays for "28 Days Later," the space thriller "Sunshine" (2007), and the terrifying "Annihilation" (2018), his second feature as a writer-director. (He also wore both hats on "Ex Machina" and "Men.") We accept these premises because we accept the conventions of genre, and because the stories themselves, for all their visceral grip, stake little claim to real-world verisimilitude. But "Civil War" has loftier ambitions; its parable of American infighting means to sound a note of queasy alarm, as if we were just one secessionist screed or Presidential abuse of power away from tumbling into a comparable nightmare.

Why, then, despite the sweep and scale of Garland's world-building and world-destroying—and with an election-year release titled "Civil War"—do we remain at arm's length, engaged yet unconvinced? As the four principal characters make their way south, they bear witness to an America gone unsurprisingly mad. But, even when a knot forms in the pit of your stomach, you're more persuaded by the tautness of Garland's craft, the skill with which he modulates suspense and dread, than by his understanding of how such an immense catastrophe might really play out. Whenever the mood lightens, you know, instinctively, that a tragic swerve is right around the corner. When Lee and her companions are ambushed at an abandoned Christmas theme-park display, your terror is held in check by the winking nastiness of the setup—and that's before a lawn Santa catches a bullet in the face. The movie's most chilling sequence—in a nicely demented touch, Jesse Plemons, Dunst's offscreen husband, pops up as a murderous psychopath—is also its most dubiously contrived. Was it really necessary to introduce and then immediately sacrifice two nonwhite characters to score a point about the racism that lurks in America's heartland? It's not the only question Garland leaves unanswered.

The point, if "Civil War" has one, is that war is not only hell but also addictive, and that, for an alarming swath of the population, the joy of meting out rough justice with a rifle outstrips any deeper moral or ideological convictions. But war coverage has its own allure, and before long Jessie is hooked; the more field experience she gets, the more indelible the rush. In skirmish after skirmish, she masters the tools of her trade and inures herself to the trauma that comes with using them. As bullets whiz by and tanks roll past, she learns what it means to embed oneself, to capture dramatic images without interfering, to risk everything for the sake of the shot. (The scenes of photographers at work are often set to jarringly irreverent needle drops; a blast of De La Soul seems to capture—and interrogate—the desensitization their job demands.)

As a tribute to the work that journalists do, "Civil War" feels entirely sincere—but even here the fuzziness of Garland's execution undermines his nobler intentions. What outlets and platforms are Lee and her colleagues using to disseminate that work? The media industry, a disaster zone even in peacetime, appears to have collapsed. Internet connections are spotty to nonexistent, and the conflict rages, for better or worse, without the breathless incursions and distortions of social media. One character makes wry reference to "whatever is left of the New York *Times*"; another notes that in the U.S. Capitol journalists are treated as enemy combatants and shot on sight. Such demonization of the press, with its grim echo (or harbinger?) of Trumpist rule, is about as close as the movie gets to advancing a remotely political point of view. The more arresting its doomsday images—a daring raid on the White House, a fiery assault on the Lincoln Memorial—the more Garland's war loses itself in a nonpartisan fog, a thought experiment that short-circuits thought.

That doesn't mean it isn't amusing, as the credits roll on the appalling final tableau, to speculate about the aftermath. Will the Western Forces be required to make state-specific concessions in order to maintain their rickety alliance? Will California start banning books if Texas relaxes its abortion laws? I have a sneaking suspicion that Florida presses on with its own fight for independence, and in so doing ushers in the war's next phase. If at first you don't secede, try, try again. ♦

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CARTOON CAPTION CONTEST

Each week, we provide a cartoon in need of a caption. You, the reader, submit a caption, we choose three finalists, and you vote for your favorite. Caption submissions for this week's cartoon, by Benjamin Schwartz, must be received by Sunday, April 28th. The finalists in the April 8th contest appear below. We will announce the winner, and the finalists in this week's contest, in the May 13th issue. Anyone age thirteen or older can enter or vote. To do so, and to read the complete rules, visit contest.newyorker.com.

THIS WEEK'S CONTEST

“ ”

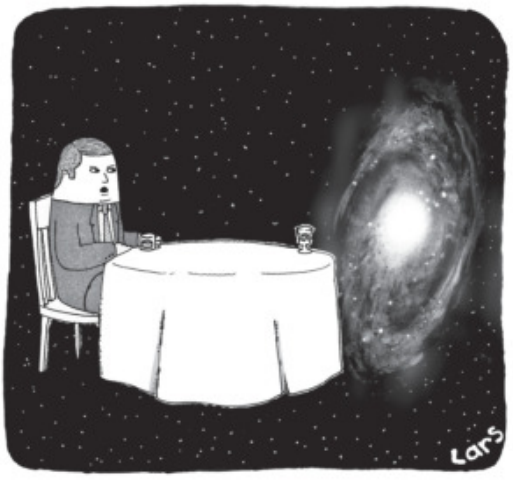
THE FINALISTS

"No bedtime story until you clean up that mess you made downtown."
Paul Benedetto, Guelph, Ont.

"Sorry, girl, we're not allowed back at the dog park."
Aaron Schur, San Francisco, Calif.

"It's nice to have someone to read to again, since you ate the kids."
Nicole Chrolavicius, Burlington, Ont.

THE WINNING CAPTION



"You could have mentioned that those photos were from thirteen billion years ago."
Jake Phillips, Washington, D.C.

No one should go to prison for having an abortion.

40% of women live in countries where abortion is banned or restricted. In some cases, women having abortions can be prosecuted and imprisoned. Without access to safe care, 35 million people every year turn to unsafe abortions and as a result, an estimated 22,800 die.

We need your help to continue our global campaigns to decriminalize abortion and make choice possible for women everywhere.

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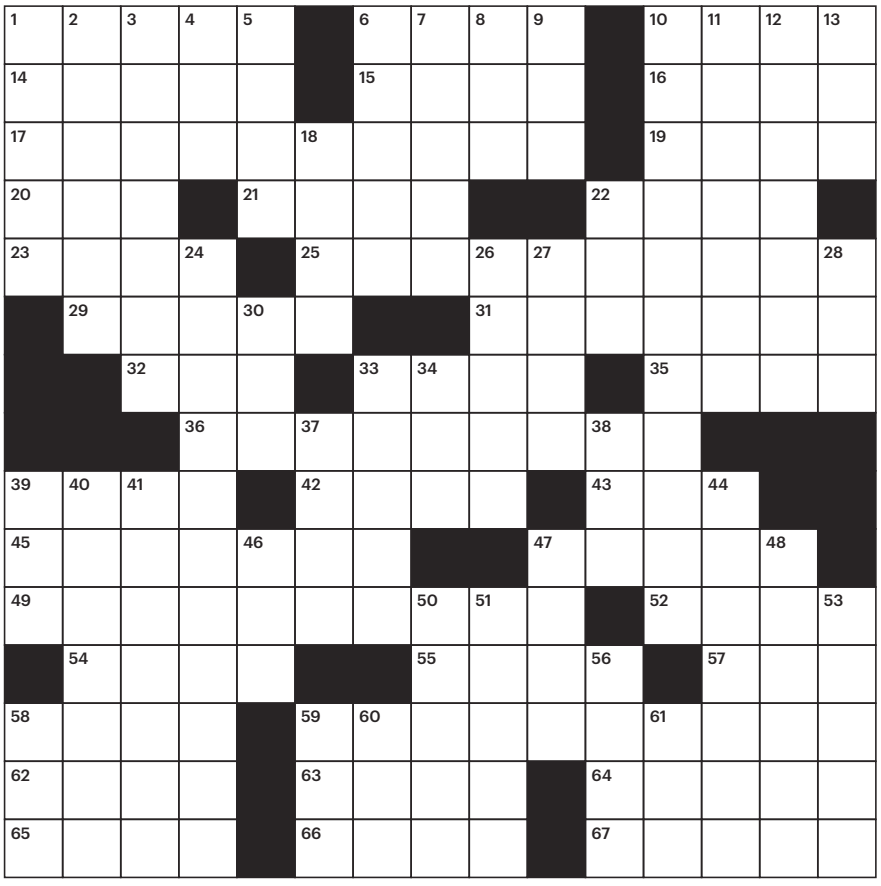
PUZZLES & GAMES DEPT.

DO YOU FOLLOW?

A themed crossword.

BY REBECCA GOLDSTEIN



ACROSS

1 Homeland of the Dalai Lama
6 Wicked
10 "Over here!," furtively
14 Inner self, to Jung
15 Word after candy or sugar
16 "Stay in your ___"
17 Breed sent after a scent
19 God who oversees Valhalla
20 ___ milk (non-dairy option)
21 Offer up on Whatnot or Poshmark
22 Letters at the start of a link
23 Wilson of "Cars"
25 Phone download for the health-conscious
29 "Make room on the couch"
31 Shoulder embellishment
32 Joined at the ___
33 Denim entrepreneur ___ Strauss
35 Instagram's parent company
36 Piece of filming equipment that allows for a smooth moving shot
39 Beverage brand that removed "uth" and "ach" from a Greater Miami neighborhood to get its name
42 Taiwanese computer company
43 Furious
45 "Let me get cleaned up"
47 Emerald ash ___ (destructive insect)
49 Structure for monitoring flights or weather
52 "Ouch!"
54 Air Force 1 brand
55 Way out
57 Starchy Polynesian staple
58 Green gemstone
59 "Sounds about right" . . . or a description of 17-, 25-, 36-, and 49-Across
62 Where some abandon ship?
63 Aaron played by Leslie Odom, Jr., in "Hamilton"
64 Supply (with)
65 Mardi ___
66 Taylor-Joy of "The Queen's Gambit"
67 Toys for a windy day

DOWN

1 Off limits, as a topic
2 Partner's parents, perhaps
3 Gene-therapy field
4 Brooding genre of music
5 Little amounts
6 Bacteria that can be used to produce human insulin
7 High-flying gymnastics event
8 The Stonewall ___ (gay-liberation landmark)
9 Was ahead
10 Part of a CliffsNotes guide
11 Sob story, say
12 Bit of a conversation
13 What X equals in Roman numerals
18 Weightiness
22 Pre-tax funds for medical expenses: Abbr.
24 Gragers, thundersticks, and vuvuzelas, e.g.
26 St. Kitts and ___
27 Grand in scale
28 School fund-raising grp.
30 Make a selection
33 Rodeo rope
34 www.barnard.___
37 Toward sunrise
38 "*Te* ___" ("I love you," in Spanish)
39 Knight's title
40 Carrier based in Muscat
41 "I wouldn't do that if I were you"
44 Song known only by mega-fans
46 Previously, in poetry
47 Londoner or Lancastrian
48 First-year athlete
50 Fatigued
51 Over the top, in slang
53 Tendrils of smoke or hair
56 Journey of a thousand miles, maybe
58 Image file extension
59 "More info soon," for short
60 Attila the ___
61 E.P.A. pollution measure

Solution to the previous puzzle:

S	O	N	A	R	■	D	A	M	■	E	M	I	T	S
C	R	I	M	E	B	O	S	S	■	M	A	R	I	E
R	A	K	E	D	I	T	I	N	■	A	N	I	M	E
E	C	O	N	■	R	E	F	■	R	I	N	S	E	S
A	L	L	■	M	D	S	■	S	A	L	■	S	Z	A
M	E	A	D	O	W	■	S	K	I	■	■	C	O	W
■	■	■	R	O	A	S	T	I	N	G	P	A	N	S
■	S	W	E	E	T	C	A	R	O	L	I	N	E	■
C	R	O	W	D	C	O	N	T	R	O	L	■	■	■
A	I	R	■	■	H	R	S	■	S	O	L	V	E	R
T	R	E	■	B	E	E	■	O	H	M	■	U	N	O
F	A	T	H	E	R	■	F	B	I	■	O	L	G	A
I	C	H	A	T	■	L	O	A	N	E	R	C	A	R
S	H	I	R	T	■	O	N	M	E	S	S	A	G	E
H	A	N	D	Y	■	P	T	A	■	T	O	N	E	D

Find more puzzles and this week's solution at **newyorker.com/crossword**

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